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# AN
# ESSAY
# ON
# CHEMICAL NOMENCLATURE,

BY

K

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*IN WHICH ARE COMPRISED*

## OBSERVATIONS ON THE SAME SUBJECT,

BY

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G.R. III.
BRITISH MUSEUM

TO

# RICHARD KIRWAN, Esq.

DEAR SIR,

YOU add to the obligations already conferred on me, by your kind acceptance of this teſtimony of my reſpect and eſteem. I am not ſolicitous to praiſe that merit of which all the cultivated part of the world ſo well knows the value: But I am happy to embrace this opportunity of indulging

ing the ſentiment of veneration for pre-eminent ſcience and virtue, which a contemplation of your character cannot but excite.

I am,

DEAR SIR,

Your moſt devoted,

very humble ſervant,

*STEPHEN DICKSON.*

# CONTENTS.

## CHAPTER I.

## FOUNDATIONS OF CHEMICAL NOMENCLATURE.

§ 1. *CONNEXION of Nomenclature with the two different modes of arranging Subſtances* - - - - page 1

2. *RULES of Chemical Nomenclature* - - 19

I.

The ſame ſpecific name ſhould never be applied to ſubſtances of different ſpecies - - - 19

II.

Synonyms ſhould be ſparingly admitted - - 26

III.

Ancient names which expreſs the ſame combinations of ideas as we have occaſion to employ ſhould be preferred to new ones, unleſs they have grown obſolete; but every name ought to be applied as nearly as poſſible in the ſenſe which general uſe has annexed to it - - 28

IV.

New names ought not to convey hypothetic diſtinctions - - - - - - page 38

V.

New names ought to aſſimilate with the language into which they are introduced, and ought to correſpond with the genius of the languages from which they are reſpectively derived - - 44

VI.

New names ought to be derived from the Latin, in preference to any other foreign language - - 52

## CHAPTER II.

## NAMES OF CHEMICAL PRINCIPLES.

§ 1. *Denomination of chemical principles in general* - - - - - 64
2. *Gravity* - - - - - 65
3. *Electricity* - - - - - 66
4. *Magnetiſm* - - - - - ibid.
5. *Fire* - - - - - ibid.
6. *Light* - - - - - 79
7. *Phlogiſton* - - - - - 80
8. *Oxygen* - - - - - 105

§ 9. *Mephite* - - - - page 113
10. *Carbone* - - - - - 119

## CHAPTER III.

## NAMES OF AIRS.

§ 1. *Denomination of airs in general* - - 122
2. *Oxygen air* - - - - - 135
3. *Mephitic air* - - - - 138
4. *Epinitrous air* - - - - - 143
5. *Nitrous air* - - - - - 149
6. *Sulfuriſed mephitic air* - - - - ibid.
7. *Sulfuriſed nitrous air* - - - 150
8. *Phoſphoriſed mephitic air* - - - ibid.
9. *Inflammable air* - - - - - ibid.
10. *Hepatic air* - - - - - 152
11. *Phoſphoreal air* - - - - 154
12. *Marſh air* - - - - - 155
13. *Animal air* - - - - - 156
14. *Hepatic vapour* - - - - 157
15. *Animal vapour* - - - - - ibid.
16. *Oleaginous and bituminous airs* - - 158
17. *Atmoſpheric air* - - - - - ibid.
18. *Vapours in general* - - - - 159

## CHAPTER IV.

## NAMES OF ACIDS.

§ 1. *Denomination of acids in general* - page 160
2. *Sulfureous acid* - - - - 166
3. *Sulfureous air* - - - - - 168
4. *Vitriolic acid* - - - - - 170
5. *Oxyvitriolic acid* - - - - 172
6. *Nitrovitriolic acid* - - - - 173
7. *Mephitiſed vitriolic acid* - - - 174
8. *Nitrous acid* - - - - - ibid.
9. *Nitrous vapour* - - - - 179
10. *Nitric acid* - - - - - 180
11. *Nitric air* - - - - - 182
12. *Muriatic acid* - - - - ibid.
13. *Muriatic air* - - - - - 183
14. *Oxymuriatic acid* - - - - ibid.
15. *Oxymuriatic air* - - - - 185
16. *Nitromuriatic acid* - - - - 186
17. *Phoſphoreous acid* - - - - ibid.
18. *Phoſphoric acid* - - - - ibid.
19. *Phoſphoric air* - - - - - ibid.
20. *Fluoric acid* - - - - - ibid.
21. *Fluoric air* - - - - - 187
22. *Boracic acid* - - - - - ibid.
23. *Arſenitic acid* - - - - - 188
24. *Arſenic acid* - - - - - ibid.

§ 25. *Molybdenic acid* - - - page 188
26. *Tunſtenic acid* - - - - - 189
27. *Succinic acid* - - - - - ibid.
28. *Fixed air* - - - - - 191
29. *Vinegar* - - - - - - 195
30. *Acetous acid* - - - - - 196
31. *Acetic acid* - - - - - ibid.
32. *Acetic air* - - - - - - 197
33. *Lignic acid* - - - - - 198
34. *Empyreumatic lignic acid* - - - ibid.
35. *Tartareous acid* - - - - 200
36. *Empyreumatic tartareous acid* - - 201
37. *Saccharine acid* - - - - ibid.
38. *Empyreumatic ſaccharine acid* - - 208
39. *Citric acid* - - - - - - 209
40. *Malic acid* - - - - - 210
41. *Gallic acid* - - - - - ibid.
42. *Camphoric acid* - - - - 211
43. *Benzoic acid* - - - - - ibid.
44. *Ciceric acid* - - - - - ibid.
45. *Suberic acid* - - - - - 212
46. *Sebaceous acid* - - - - ibid.
47. *Lactic acid* - - - - - - 213
48. *Saclactic acid* - - - - - 214
49. *Lithic acid* - - - - - ibid.
50. *Laccic acid* - - - - - 215
51. *Formiceous acid* - - - - ibid.

§ 52. *Sericeous acid* - - - - page 213
53. *Pruſſic acid* - - - - - 216

## CHAPTER V.

## NAMES OF ALKALIS.

§ 1. *Denomination of alkalis in general* - - 217
2. *Vegetable alkali* - - - - 227
3. *Foſſil alkali* - - - - - 235
4. *Volatile alkali* - - - - - 240
5. *Alkaline air* - - - - - 244

## CHAPTER VI.

## NAMES OF EARTHS.

§ 1. *Denomination of earths in general* - - 245
2. *Lime* - - - - - - 246
3. *Magneſia* - - - - - - 247
4. *Argil* - - - - - - 249
5. *Silice* - - - - - - 253
6. *Baryte* - - - - - - 254
7. *Stronthia* - - - - - 255
8. *Jargone* - - - - - - 256
9. *Sidneia* - - - - - - ibid.
10. *Adamantia* - - - - - 257
11. *Oſſia?* - - - - - - ibid.

## Chapter VII.

## NAMES OF METALS.

§ *Denomination of metals in general* - page 259

## Chapter VIII.

## NAMES OF NEUTRAL SALTS.

§ 1. *Denomination of neutral ſalts in general* - 263
2. *Denomination of triple neutral ſalts* - - 276
3. *Denomination of quadruple neutral ſalts* - 278
4. *Trivial names of particular neutral ſalts* - 279
5. *Names of certain metallic neutral ſalts* - 280

# PREFACE.

MY attention was firſt particularly turned to Chemical Nomenclature by being engaged as one of a Committee of the College of Phyſicians of Dublin, in the preparation of a Pharmacopœia. I ſaw that men's minds were unſettled with regard to the principles by which chemical nomenclature ought to be regulated, and I thought that I might render ſome little ſervice to ſcience by endeavouring to aſcertain and apply thoſe principles. At my leiſure hours I threw my thoughts on paper, and as I reſorted to the ſubject merely as an amuſement, it imperceptibly grew under my hands to a bulk that I fear ſome may think diſproportionate to its value.

In ſome diſquiſitions I have certainly indulged more extenſively than was neceſſary for the mere purpoſe of adjuſting the nomenclature of the ſubjects which engaged my attention. The importance of ſome of theſe ſubjects will perhaps be a ſufficient juſtification of the latitude I have taken with regard to them. As to the reſt, I plead in apology the elegant obſervation of Mr. Congreve: "All truth is ſo amiable in itſelf, that even where it is of leaſt importance there is a pleaſure in the ſearch after it, and a ſatisfaction in the vindication of it."

I have often indeed heard that our attention ſhould not be arreſted by words, but ſhould be fixed on things; that grammatical diſquiſitions are puerile contentions; and ſuch like common place contumelies againſt philological inveſtigations. But can any one reflect for a moment, without acknowledging, that our thoughts can neither be ſatisfactorily adjuſted, nor correctly imparted, unleſs we poſſeſs words aptly accommodated to them; and conſequently that the improvement of language muſt ever keep pace with the progreſs of the underſtanding? Language is the attire in which knowledge muſt be clothed; and, like our bodily veſture, may either encumber, diſguiſe, and obſcure it, or may diſtinguiſh its rank, diſplay its ſtrength, and enhance its native beauty.

The influence of language upon thought has, in all ages and countries, been conſiderable. This influence operates favourably to the intereſts of ſcience, where there are etymologies which lead the mind at once to the intended object of contemplation; where there are well-conſtructed compound words which prevent the labour of ſtudy, and the exertions of memory; and even where names of any kind are conferred on objects which, though preſenting themſelves before us every day, would be diſregarded, like the faces of ſtrangers whom we meet in the ſtreets, had they not appropriate deſignations, an acquaintance with which arouſes our attention, impels us to recognize thoſe objects, and tempts us to an inveſtigation of their nature. But in too many inſtances this influence is no leſs unfavourable to the advancement of knowledge: poverty of language circumſcribes the flight of ideas; inaccuracy of expreſſion precludes preciſion of thought; equivocal words generate erroneous opinions; the aſſociation of improper acceſſory ideas and judgments with well-known terms diffuſes and ſtrengthens prejudices; injudicious etymologies entrap the apprehenſion; and figurative expreſſions, miſtaken for actual definitions, fill up the meaſure of confuſion and inconſiſtency of thought that flow from the abuſes of ſpeech.

The ancients, eſpecially the Greeks and Romans, took conſiderable pains to poliſh and improve their languages; and in modern times ſome of the moſt diſtinguiſhed philoſophers in England and France have not diſdained to employ their talents in the ſame way. But if propriety of ſpeech be worthy of ſuch attention when we conſider it as miniſtering to the ordinary intercourſe of mankind; with how much more ſtrictneſs ſhould we regard it when we conſider it as the agent of philoſophic preciſion!

In fact the relation of ſpeech to things is an object of ſuch importance that, as Theophraſtus remarks, it muſt always claim a conſiderable ſhare of the attention of the philoſopher. Της προς τα γραμματα τȣ λογȣ σχεσεως ὁ φιλοσοφος προηγȣμενως επιμελησεται, το τε ψευδος διελεγχων, ϗ το αληθες αποδεικνυς.

From the following diſquiſitions I think it will appear, that the language of chemiſtry is not eſſentially or radically faulty; that it is capable of being reformed without being new-modelled; and that the ſteady eſtabliſhment and judicious augmentation of the ancient nomenclature would be much more favourable to the advancement of the ſcience, than the introduction of any entire ſyſtem of new technical names. To theſe conſiderations let us add the cautions of Quintilian: "Uſitatis verbis "tutius utimur; nova non ſine quodam peri-"culo fingimus: nam ſi recepta ſunt modi-"cam laudem afferunt, repudiata etiam in jo-"cos exeunt."

From the manner in which theſe pages have been written, having been frequently thrown aſide from profeſſional interruptions, and reſumed after long intervals of time, one advantage has accrued, which I expect will in ſome meaſure compenſate for my own inſufficiency of judgment; I have had the opportunity of adjuſting and frequently of correcting my opinions by converſation with perſons of much greater talents and learning than myſelf.

In particular, I owe many obligations to Mr. Kirwan, for his advice and aſſiſtance. When I had written the principal part of the following pages, I ſubmitted them to his peruſal, and he found my opinions to agree in general ſo much with his own, that he with great kindneſs communicated to me his obſervations on the ſubject of chemical nomenclature, and gave me permiſſion to make whatever uſe of them I might think proper. I have accordingly, with his approbation, incorporated the principal part of them with my own; diſtinguiſhing, however, and acknowledging what I owe to him.

Mr. Kirwan 'thought it proper that ſome

'attempt ſhould be made, at the preſent 'time, to aſcertain the principles, and put a 'ſtop to the fluctuations of chemical language.' He was alſo deſirous, on another account, of delineating the ſyſtem of nomenclature which he adopted. 'Within theſe laſt twenty years,' he remarks, 'the boundaries of chemiſtry have 'been much enlarged by the diſcovery of 'many new ſubſtances, and a revolution has 'taken place in ſome of its moſt important 'principles. In ſuch circumſtances ſome alter-'ation of the received language was inevita-'ble. The ſubſtances newly diſcovered, and 'their compoſitions, as well with each other 'as with the ſubſtances antiently known, ne-'ceſſarily demanded new names; and the de-'nominations grounded on the abdicated prin-'ciples required to be new-modelled to ſuit 'thoſe that had ſupplanted them. In this 'ſtate of things ſome eminent chemiſts have 'aimed at the entire ſubverſion of the antient 'nomenclature; others have confined their 'ſchemes of reformation to ſuch caſes only 'in which the improprieties of denomination 'were prominent and notorious. With the 'principles of this claſs of reformers I con'feſs my agreement. As none of them, how'ever, has as yet publiſhed any plan of refor'mation adapted to the Engliſh language; 'and as I am at preſent at the eve of pub'liſhing a treatiſe in which many new terms 'muſt of courſe be introduced, I find my'ſelf neceſſitated to trace the outlines of the 'ſyſtem of nomenclature I have followed; not 'from the preſumptuous deſign of impoſing it 'upon others, but merely from the view of ren'dering my own future communications more 'intelligible.'

# ESSAY
# ON
# CHEMICAL NOMENCLATURE.

## CHAPTER I.

## FOUNDATIONS *of* CHEMICAL NOMENCLATURE.

### § I. *CONNEXION OF NOMENCLATURE WITH THE TWO DIFFERENT MODES OF ARRANGING SUBSTANCES.*

SCIENCE requires, that ſuch qualities as are common to many ſubjects ſhould be contemplated apart from ſuch as are only common to a few, or peculiar to individuals; that our conceptions of theſe ſeveral qualities ſhould be claſſed under generic and ſpecific heads; that theſe heads ſhould be diſtinguiſhed by names; and, finally, that ambiguity in the ſenſe of theſe names ſhould be prevented by perſpicuous definitions.

Hence we perceive, that nomenclature muſt be poſteriour to the inveſtigation of ſcience, but anteriour to the communication of it.

The excurſive genius of man is continually deſcrying new ſcenes in the vaſt theatre of the material world; developing unknown powers and qualities in natural bodies; correcting the erroneous views, which accidental falſe lights had preſented to the mind; and aſſociating the ſeveral ideas, which theſe diſcoveries call forth, in various and novel combinations. Science therefore has a continual claim upon philology; for as ſhe ſubverts errours, and eſtabliſhes truths, ſhe is entitled to be enriched with correſpondent corrections and augmentations of language. Words expreſſive of ſuch combinations of ideas as have no real exiſtence correſponding to them are uſeleſs or deceptive, and ought to be expunged from the records of ſcience; while words expreſſive of ſuch combinations as have an archetype in nature, not hitherto noticed, demand a place in ſcientific nomenclature.

What then, it may be ſaid, muſt language fluctuate with the ebbs and flows of ſcience? This is the very evil, at the prevention of which we aim; the grievance in chemical literature, that calls moſt earneſtly for redreſs. New combinations of ideas ſhould certainly receive new names, if worthy of diſtinct contemplation; but names once given to ſkilfully combined aſſemblages of ideas ought to remain permanent as the pillars of a Tuſcan edifice, and exhibit themſelves untouched amidſt the dilapidations of hypotheſes.

Let us inquire then how chemical ideas may be ſo ſkilfully combined, as that the names of their combinations may be perpetual. Let us ſee, whether it be not poſſible to eſtabliſh the language of chemiſtry on ſuch a foundation, as that philoſophers of every ſect may detail facts without ſeeming to violate truth, and ſtate their opinions without running the riſk of miſleading others, and being themſelves miſapprehended.

There are two modes of arranging ſubſtances into kinds and ſorts; the one ariſes from analytic, the other from ſynthetic examination. In analytic inveſtigation, the qualities of a great number of compound ſubſtances are claſſed together; a few ſimple ideas common to them all are combined, and theſe conſtitute the higheſt genus, which includes all the ſubſtances taken into conſideration. Various ideas are afterwards ſuperadded to the former in ſeparate combinations; theſe conſtitute ſpecies, each of which includes ſome only of the ſubſtances primarily conſidered. Of theſe ſpecies each may be rendered a ſubalternate genus, again reſolvable into ſpecies; which alſo may become, in like manner, ſubalternate genera, containing ſpecies under them: until all the univerſal ideas be exhauſted, and ſingular terms (as the logicians ſpeak) be alone applicable to the ſubſtances indicated by the ſubdiviſions of the loweſt ſpecies.

For example, a great number of ſubſtances are ſapid and ſoluble in water; theſe qualities indicate a genus, the ſubſtances comprized under which are called ſalts. Of theſe ſalts there are different ſpecies, poſſeſſed of peculiar adſcititious properties. One ſpecies is diſtinguiſhed by acidity and tendency to ruſh into combination with alkalis, earths, and metals. Theſe ideas, ſuperadded to thoſe of the higheſt genus, conſtitute the ſubalternate one of acids. This genus is diviſible into ſpecies poſſeſſed of eſſential differences, ariſing from the reſpective peculiarities of different acids, with regard to their acidity and powers of attraction; hence vitriolic acid, muriatic acid, nitric acid, and ſo forth.

The other method of arranging ſubſtances into kinds and ſorts is the conſequence of ſynthetic examination. The qualities of individual ſubſtances, and theſe the moſt ſimple that are known, or can be conceived to exiſt, are ſeparately conſidered. Each collection of ideas characteriſtic of one of theſe ſubſtances, conſidered with the addition of any one ſimilar collection, conſtitutes a fundamental genus. The ſpecies of this genus are formed by the expreſs combinations of the collection of ideas characteriſtic of that ſimple ſubſtance, which is the primary ſubject of our inquiry, with other collections of ideas, which are each, in like manner, characteriſtic of a ſimple ſubſtance. Of theſe ſpecies each is rendered a ſubalternate genus, and divided into ſpecies, by adding to the combination of ideas expreſſive of two ſimple ſubſtances the idea of ſome third. Thus, from the variety and different degrees or complexity of combination of the ideas, which denote ſimple ſubſtances, innumerable ſubalternate genera and ſpecies ariſe.

For example, the higheſt genus of ſubſtances conſiſts of thoſe which either cannot be, or at leaſt have not been, reſolved into more ſimple parts. The ſpecies of this genus may be conſidered as conſtituting the fundamental genera of chemiſtry; ſuch are oxygen, mephite, phlogiſton, the ſeveral baſes (or conſtituent parts, wherein conſiſt the eſſential differences) of acids, alſo metals, earths, and fixed alkalis. Next, oxygen, in combination with ſome other of theſe ſimple ſubſtances, may be conſidered as conſtituting a ſubalternate genus, of which acids, metallic calces, water, and ſome other ſubſtances are ſpecies. Again, ſome of theſe, the ſpecies acids for example, may be converted into genera, by combining with each of the ſubdenominations of acids various alkalis, earths, and metals.

Let us now inquire, how theſe different methods of arrangement tend to influence chemical nomenclature. Names given to the objects of chemical inveſtigation arranged according to the analytic method are of two kinds; names of general ideas united in various combinations, expreſſive of claſſes of ſubſtances more or leſs heterogeneous; and names of the individual ſubſtances themſelves. Of names of the former kind the propriety and utility depend upon the conſonance of thoſe obſervations, according to which the ſeveral genera and ſpecies were marſhalled, with the phenomena exhibited by nature. If nominal diſtinctions correſpond with real combinations of qualities in ſuch a manner, that from the higheſt genus to the loweſt ſpecies terms become leſs general, as the compound ideas they ſtand for become leſs univerſal; and theſe ideas are made leſs univerſal, as they indicate claſſes compriſing ſubſtances leſs heterogeneous; this nomenclature muſt be correct, as long as nature remains unchanged.

Of the names of individual ſubſtances the propriety reſts ſolely upon the accuracy of their definitions. In other words, the fidelity and preciſion of the obſervations, according to which qualities are grouped in any inſtance, and affirmed to be inherent in any particular ſubſtance, or claſs of homogeneous ſubſtances, to which an arbitrary name is affixed, conſtitute the ſole ſtandard, by which the propriety of that name is to be eſtimated. If ſuch qualities only be grouped and deſigned by names, as really co-exiſt, although the imperfections of knowledge will be accompanied by parallel imperfections of nomenclature, yet, as far as knowledge and nomenclature go, they will be juſt. If ſubſtances ſuppoſed to be ſimple be diſcovered to be complex, new names muſt be invented for denoting their component parts; but theſe complex ſubſtances, claſſed according to their known qualities, which they poſſeſs equally after the diſcovery of their compoſition as they had done before, are ſtill entitled as much as before to their ancient denominations. Thus nomenclature, before the diſcovery of theſe truths, could not have miſled to the enunciation of untrue propoſitions; and, after their diſcovery, requires additions, but not emendations.

A farther advantage interwoven with a nomenclature fabricated in this manner is, that, however erroneouſly general ideas may have been formed, and however improper and uſeleſs the names of ſuch ideas, including the adumbration of heterogeneous ſubſtances, ſubſequent obſervation may diſcover to have been; if the names of individual ſubſtances, or of claſſes of homogeneous ſubſtances, be not indicative of qualities which they do not poſſeſs, nomenclature will be little affected by the detection of theoretical errours. The affinities of ſubſtances may be partly unknown, although we can ſufficiently identify theſe ſubſtances by the qualities, which we do know to belong to them. Subſtances therefore may be erroneouſly claſſed, as ſuppoſed to bear certain relations to other bodies, but individually may be diſtinguiſhed and denominated without danger of miſtake. Thus the great fabric of nomenclature may remain undefaced amid the ſtorms of theory, which can only carry off the light ſcaffolding of hypothetic arrangement.

Let us now reverſe the medal, and view the ſtate of chemical nomenclature eſtabliſhed upon the ſynthetic method. Names are here alſo of two kinds, general terms, and names of ſubſtances. The general terms, in this caſe, are not affixed to ſuch combinations of ideas as are found coexiſting in nature; they are forged from the names of ſubſtances known or ſuppoſed to exiſt, and denote the qualities of theſe ſubſtances in fancied, or poſſible, as well as in actual combinations with the qualities of others. Hence chemiſtry muſt labour under a lifeleſs burden of unrealized and unprofitable names.

The names conferred on ſubſtances muſt be more or leſs complex, according to the nature of the things they ſignify. If all the ſimple ſubſtances in the univerſe were known to nomenclators, theſe ſubſtances would receive names either merely arbitrary, or indicative of their powers. Names of the former deſcription, it is to be ſuppoſed, would be preferred, as being more capable of brevity, and being ſimple, like the ſubſtances they would be appointed to denote. Combinations of theſe primary names would then be formed, to correſpond with the ſeveral aſſociations of ſimple ſubſtances, which are diſplayed in the various productions of nature. Thus the right name of all ſubſtances, except the original ſimple ones, would ceaſe to be arbitrary, depending neceſſarily and inſeparably on the nature of the conſtituent parts of the ſeveral compounds.

If our knowledge of nature were conſummate, a language conſtructed after this manner muſt be ſcientifically perfect; though indeed the words compoſing it would be in general cumberſome, nay ſometimes inevitably ſeſquipedalian, according as the objects of our inquiries might be complicated, and the nature of our reſearches abſtruſe. But if there ſhould be any deficiencies or miſtakes in our knowledge, ſee what misfortunes would attend this philological polity. In the firſt place, of thoſe ſubſtances, the conſtitution of which is not yet wholly inveſtigated, the names muſt either be entirely withheld, or muſt veer about with every wind of doctrine. Thus an eminent philoſopher, who is of opinion, that all the vegetable acids may be arranged under the denominations, hydro-carbonous, hydro-carbonic, oxygenated hydro-carbonic; carbono-hydrous, carbono-hydric, and oxygenated carbono-hydric; confeſſes, that we are as yet ignorant of the proportions of the ſeveral ingredients in the different vegetable acids; and, under theſe circumſtances, allows us to retain the ancient names of theſe acids "proviſionally."

Secondly, If we diſcover an errour in our knowledge of the conſtitution of any one compound ſubſtance, the ſtate of our nomenclature "ſuffers the nature of an inſurrection." A wrong name having been conferred on a ſubſtance not much compounded may occaſion a neceſſity for reform in the denomination of thouſands of complex ones, of which that one forms a conſtituent part. But the detection of an errour concerning a ſubſtance ſuppoſed to be ſimple would require a total revolution in language to repair the miſtake. Thus a ſingle unforeſeen and great diſcovery might one day ſubvert the entire ſyſtem of chemical nomenclature, bereave every ſubſtance in the material world of its name, and leave the chemiſt in a ſituation not much unlike that of Aſtolfo ranſacking the moon for his wits.—It is well remarked by Mr. Keir (Dict. 42), "that "as our theories are hitherto uncertain, in"complete, and fluctuating, a much more "ſafe and permanent rule for the diviſion of "bodies may be derived from the difference "of their properties, than from our notions "of their conſtituent parts; and as their utility

" depends altogether on their properties, a diſ-
" tinction founded on them will be moſt ap-
" plicable to all practical purpoſes."

Of the two ſyſtems of chemical nomenclature, which at preſent lay claim to the ſupport of philoſophers, neither is pure in its conſtruction. The old is chiefly built on the analytic method; but deviates from it where deviation is moſt dangerous. The new affects the ſynthetic; but cannot always accompliſh it, and often betrays the defects of ſuch a plan, without attaining its advantages.

From the compariſon I have drawn between the leading features of theſe two methods, it ſeems evident, that chemical nomenclature is not to be reformed by an abolition of the principles, upon which it was originally conſtructed. It becomes us, however, to inquire whether the advantages of both ſyſtems may not be made to unite in the ſupport of ſcience; whether the preſervation of the old, where innovation would be unphiloſophic, would be endangered by the introduction of ſome names conſtructed on the principles of the new.

On this queſtion I concur with ſeveral eminent and impartial chemiſts, who conſider the uſe of compound names, to denote compound ſubſtances, under judicious management, and with due limitations, not only as abridging conſiderably the labour of learning the names of things, but as contributing eminently to preciſion, to perſpicuity, and to permanency of denomination. Were every compound ſubſtance to be denominated in this way, Glauber's wonderful ſalt, ſpecific purging ſalt of Paracelſus, febrifuge and digeſtive ſalt of Sylvius, we ſhould waſte our lives, like the Chineſe, in learning the meaning of characters, without having time to make any advancement in the knowledge of things. Whereas, when compound ſubſtances are denoted by compound words, we have only to learn the meaning of the primitive ſounds, and every name compoſed of them contains in its ſtructure its own explanation. Thus the ſtudent, who knows the names of acids and alkalis, has no occaſion to ſtop, and inquire what is meant by vitriolated foſſil alkali, vitriolated vegetable alkali, muriated vegetable alkali.

By this contrivance other advantages are alſo

gained;

gained; ambiguity and obſcurity are avoided, than which no greater obſtacles can be thrown in the way of ſcience. For example, *the conveyed matter of Kerkringius ("materia perlata Kerkringii")* is calx of antimony procured, by a particular proceſs; the ſame ſubſtance, procured by the ſame proceſs, is alſo called *ceruſſe of antimony*, though it contains no lead; and the ſame ſubſtance, obtained by different proceſſes, has two or three other different names.—'New com‑ 'pounds, therefore, ſhould be expreſſed by com‑ 'pound denominations expreſſing both mem‑ 'bers of the compound.' (Mr. Kirwan.)

But while we thus argue for the admiſſion of compound names conſtructed on the principles of modern ſyſtems into our chemical language, we have always a reference to our preliminary reſervation, that it ſhould be effected not without judicious management and due limitations.—'The denominations ad‑ 'mitted ſhould be as few, as ſhort, and as ſimple, 'as the exigency of the caſes, that demand their 'admiſſion, will admit.

'Reaſonable as this rule may appear, it has 'been much conteſted. We are told, "that the

" perfection of chemical nomenclature conſiſts " in rendering ideas and facts in their exact " truth, without ſuppreſſing any thing, or mak- " ing any addition;" whence it has been in- ' ferred, " that the denominations of bodies, " that can be reduced to their elements, are " properly expreſſed by the reunion of the " names of thoſe ſame elements." This prin- ' ciple, however, would evidently lead us into ' needleſs and irkſome prolixity. The connexion ' of ſimple names with compound ideas is very ' eaſily learned. Thus the properties of *gold* ' are as well denoted by that name, and much ' more commodiouſly, than by an enumeration ' of its ſenſible appearances, and chemical pro- ' perties, the whole of which it would be for ' ever impoſſible to expreſs, as they vary with ' the number of bodies, with which it may be ' combined, or has any chemical relation. So ' the ſignification of the word *glove* is full as ' well underſtood, as if it were expreſſed in the ' German manner by the compound appella- ' tion *hand-ſhoe*. Even where words' in common uſe ' are etymologically compound, this ' compoſition is ſcarcely ever attended to, as we

‘ may obſerve in the words ***ink-horn***, ***candleſtick***, ‘ ***luke-warm***, ***holy-day***.

‘ Hence, where compound ſubſtances have ‘ already obtained ſimple names, thoſe names ‘ ſhould be retained, as nitre, common ſalt, ‘ borax, ſelenite, gypſum, ſoap.

‘ In algebra, a ſcience to which the French ‘ philoſophers very properly aſſimilate chemical ‘ language, the neceſſity of expreſſing complex ‘ quantities by ſimple expreſſions is often felt ‘ and acknowledged. Hence ſuch expreſſions ‘ as $a \overset{n}{+} \sqrt[3]{b} = p$ are very uſual.’

*(Mr. Kirwan.)*

In effecting the improvement of chemical language, to be derived from the introduction of compound denominations, the following mode ought, in my opinion, to be purſued. Setting apart thoſe ſubſtances, which are either ſuppoſed or known to exiſt, and preſumed to be ſimple, but concerning which our knowledge is ſtill incomplete; let us take into our hands thoſe ſubſtances, which we are ſure exiſt, and are comparatively ſimple with reference to others, which we have frequent occaſion to employ. Let theſe ſubſtances retain, in general, the old names, to which accident, analogy, or an analytic inveſtigation of their qualities, gave riſe, and by which they have been long diſtinguiſhed. After this pledge of ſtability, which guaranties, as it were, the perpetuity of our chemical poſſeſſions, the aid of ſyntheſis may be reſorted to with ſafety. Such compounds, as we can form with theſe comparatively ſimple ſubſtances, we are entitled to denominate according to the nature of our reſpective compoſitions.

Names, conſtructed in this way, enjoy the peculiar felicity of containing in themſelves definitions of facts, which no theory can contravene. If the names of the ſimple ſubſtances be ſhort, compounds of two of them will ſeldom be found inconveniently long. Even three may be ſometimes combined. This, however, cannot often be done; and beyond this, ſcarcely any attempt of the kind can be ſucceſsful. The great ends of language are fidelity and diſpatch in the conveyance of our thoughts. Fidelity is aſſured by names, which particularize the ſeveral ideas combined in their ſignification; but diſpatch, which is not leſs neceſſary in the affairs of life, forbids this particularization, if the combined ideas be numerous.

Preſuming it to be ſufficiently evinced, that in the reform of our chemical nomenclature it is neither neceſſary nor wiſe to attempt changing its entire ſubſtance and ſtructure, I ſhall now point out ſome rules, to which, I think, we ſhould invariably adhere in our endeavours to augment or correct the language of chemiſtry.

## § 2. *RULES OF CHEMICAL NOMENCLATURE.*

### I.

### THE SAME SPECIFIC NAME SHOULD NEVER BE APPLIED TO SUBSTANCES OF DIFFERENT SPECIES.

In ordinary diſcourſe, where preciſion is not of ſuch importance as in philoſophical language, words, which have ſhades of variety in their ſignification, not always neceſſary to be attended to, may occaſionally be indiſcriminately employed. Hence ſome words are frequently uſed in a lax ſenſe, to expreſs, in different circumſtances, ſomewhat different combinations of ideas; and that without deceiving, or occaſioning

ing any miſconception. The figurativeneſs of the poet, the copiouſneſs of the orator, increaſe and warrant this licence. But in philoſophic language, the utmoſt perſpicuity is required; every word has, or ought to have, its determinate meaning, and cannot be applied in different ſenſes without miſleading.

I do not, however, mean to condemn indiſcriminately all words bearing homonymous ſignifications. Where there lies ſo great a difference between the objects of the ſame name, that the tenor of the diſcourſe cannot but prevent equivocation, their having a common name is not only harmleſs, but may, perhaps, poſſeſs an advantage, by aſſiſting the memory, pleaſing the imagination, or uſefully aſſociating ſome adventitious idea of pleaſure or diſguſt. Thus the corporeal ſenſation and the intellectual feeling of taſte muſt be ever ſo diſtinguiſhed by the context of our diſcourſe, that there appears no danger of their being confounded, though they have the ſame name.

But the application of the ſame ſpecific names to ſubſtances of different ſorts is ſo groſs a violation of either common ſenſe or common honeſty, that at firſt ſight it might ſeem ſuperfluous to be forbidden. Tranſgreſſions of this nature, however, abound in the writings of chemiſts, eſpecially of thoſe, who profeſs to account for every thing by the magic of phlogiſton.

Of theſe abuſes I ſhall give a few examples.—

When iron is acted upon by dilute vitriolic, or nitrous acid, it is ſaid to be deprived of its phlogiſton, and the air aſcending in the proceſs is ſaid to be loaded with phlogiſton, or the inflammable principle. The air ariſing from the diſſolution of iron in the vitriolic acid is indeed inflammable, but is not phlogiſticated air. The air ariſing from a ſimilar proceſs, by means of the nitrous acid, is not only not inflammable, but even, after a while, extinguiſhes flame. Thus, according to this abſurd language, air may be combined with phlogiſton, without being phlogiſticated, and loaded with the inflammable principle, without being rendered inflammable. And theſe are equally termed phlogiſtic proceſſes.

There are other abuſes of ſpeech, in the language of chemiſtry, highly flagrant and reprehenſible. I avoid dwelling on ſuch names, as *oil of vitriol, butter of antimony, milk of ſulphur, flowers of zinc, ſaffron of Mars,* ſince it might be alleged, that the words oil, butter, milk, flowers, and ſaffron, are too obviouſly metaphorical to miſlead. Neither ſhall I ſtop to comment on thoſe leſs dangerous, than ridiculous, names; *white eagle,* and *calomel,* or *beautiful black,* conferred on a white powder; but I ſhall enumerate a few, which have a direct tendency to miſlead.

The compoſition entitled *alkalized mercury* conſiſts of mercury and chalk, and contains no alkali.

*Opaline magneſia* is a calx of antimony, procured by melting equal parts of ſulphurated antimony, common ſalt, and nitre, ſo as to cauſe fuſion without detonation. It contains neither opal nor magneſia.

Another preparation of antimony, procured by melting a mixture of one part of tartar, four of common ſalt, and five of ſulphurated antimony, has been called *medicinal regulus,* although the word regulus was purpoſely introduced into the ſcience of metallurgy to denote a metal uncombined with ſulphur.

The powder introduced under the auſpices of count Algarotti was entitled *mercury of life,* though it is devoid of the ſlighteſt admixture of mercury.

*Stahl's antimoniated nitre* is a name, which has been given to the ſalt contained in the reſidue of the liquor employed in the waſhing of deflagrated calx of antimony, after the precipitation of the antimony, from its union with vegetable alkali in that liquor, by the addition of an acid. If nitrous acid be employed, nitre, it is true, will be formed; but this nitre will not be combined with a particle of antimony. If vitriolic, or muriatic acid be employed, by either of which the precipitation may be as readily effected, the ſalt remaining in the liquor, and termed Stahl's antimoniated nitre, will not contain either antimony or nitre.

After the diſtillation of a mixture of ſulphurated antimony and corroſive muriated mercury, the reſidue, which is a combination of mercury and ſulphur, may be ſublimed; and this preparation is called *cinnabar* of *antimony,* though it does not contain any antimony.

The appellation of *mephitic air* has by ſome been conferred on fixed air, by others on phlogiſticated air; an abuſe of ſpeech, which miſled even the celebrated Macquer to ſuppoſe theſe airs the ſame.

The name *black lead* has been given to a mixture of iron and charcoal, not combined with the ſmalleſt portion of lead.

The ſame name, *ſoluble tartar*, has been applied to the different neutral ſalts, reſulting from the combination of the tartareous acid with vegetable alkali, and with volatile alkali.

*Moſaic gold* is a name given to ſulphurated tin, and alſo to ſulphurated tin and mercury combined.

Sir Charles Linnè, an author of ſingular eminence as a naturaliſt, ſpeaks in a very indeterminate manner, when he uſes chemical language, though with as much parade of ſyſtematic order, as when he treats of zoology or botany, in which departments he is always intelligible and conſiſtent. For example; "Terræ vocantur "corpora regni lapidei ſimpliciſſima; ut ſunt "arena, humus, ochra, creta, margo."

(*Amœn. Academ.* i, 544.)

Even the great ſir Iſaac Newton, when uſing the language of chemiſtry, ſpeaks indefinitely and obſcurely, applying ordinary names in an acceptation not eaſily or diſtinctly to be comprehended. Thus he ſays, that " camphire, " oil olive, linſeed oil, ſpirit of turpentine, and " amber, are fat, ſulphureous, unctuous bo" dies;" and that " a diamond is probably an " unctuous ſubſtance coagulated."

(*Optics*, *l.* ii, *part* 3, *prop.* x, *p.* 249.)

Some other inſtances of this great man's miſapplication of chemical language appear to be owing rather to the obſcure ſtate of the ſcience, which, unfortunately, he did not cultivate, than to philological delinquency. Thus he ſays, " a pſeudo-topaz, a ſelenitis, rock cryſtal, " iſland cryſtal, vulgar glaſs (that is, ſand melt" ed together) and glaſs of antimony, are ter" reſtrial, ſtony, alcalizate concretes."

(*Ditto*, *p.* 248.)

And he affirms " that ſulphur is compoſed of " an inflammable thick oil, or fat bitumen, an " acid ſalt, a very fixed earth, and a little me" tal." (*Ditto*, *p.* 359.)

## II.

## SYNONYMS SHOULD BE SPARINGLY ADMITTED.

APPLYING different ſpecific names to ſubſtances of the ſame ſort is a much more venial fault, than that which we have been juſt now reprehending; but ſtill it is a fault, ſince it encumbers ſcience with unneceſſary trappings, which, in ſome meaſure, tend to impede its progreſs. There are few words in ordinary language really ſynonimous; and in philoſophical language ſtrictly regulated there ſhould be none. Profuſion may miniſter to ornament, but it claſhes with preciſion. The movements of ſcience are clogged by exuberance of ſtyle; conciſeneſs and accuracy may be conſidered as its friction-wheels.

I confeſs, however, that in the republic of letters it is difficult to preſerve ſuch exact ſubordination, as that words ſhall not ſometimes ſtruggle for pre-eminence, and the contending parties on each ſide eſtabliſh, at length, conſiderable ſway. Thus nitre, ſalt, alum, green vitriol, will, in all probability, never be ſupplanted ed by nitrated vegetable alkali, muriated foſſil alkali, ſuper-vitriolated argil, vitriolated iron. But although it be not poſſible to render philoſophic language ſo chaſte, as that each idea ſhall be wedded to a ſingle expreſſion; yet we may at leaſt avoid imitating, in our nomenclature, the monſtrous polygamy of the Eaſt: the Arabians, it is ſaid, have fourſcore names for honey alone!

The French chemiſts, by their introduction of whole hoſts of ſyſtematic names, have done irreparable injury to the ſcience; for although it be as little probable, that they will eſtabliſh all their new chemical names, as their new political or chronological ones, in other countries beſide their own; yet the great merit of their philoſophical writings will ſo embalm their language, as to prevent it from ever entirely periſhing.

### III.

### ANCIENT NAMES, WHICH EXPRESS THE SAME COMBINATIONS OF IDEAS, AS WE HAVE OCCASION TO EMPLOY, SHOULD BE PREFERRED TO NEW ONES, UNLESS THEY HAVE GROWN OBSOLETE; BUT EVERY NAME OUGHT TO BE APPLIED, AS NEARLY AS POSSIBLE, IN THE SENSE, WHICH GENERAL USE HAS ANNEXED TO IT.

NAMES may be ſaid to acquire, by long tenure, a ſort of property in the things they ſignify, ſo that any attempt to diſpoſſeſs them appears like outrage and injuſtice. In ſeveral ancient names there is couched an hiſtorical reference to the earlier opinions of men, concerning the ſubjects to which they appertain, that is not uninſtructive, and that gratifies the taſte of a reflecting mind. We contemplate with veneration the relics of antiquity, even while we convert them to the purpoſes of modern life. What is the feeling, which occupies us, when we trace the grandeur and gloom of Gothic ſuperſtition in the long vaulted aiſles of an old cathedral; or when the battlements and mote of an ancient caſtle, now the ſeat of ſome gay lordling, recal to our imagination the warlike ſpirit of feudal independence? It is that ſame feeling, differently directed, which conſecrates the nomenclature of antiquity.

No aſtronomer believes, that a certain tract of the heavens is occupied by living beings, in the ſenſe, which the name zodiac ſeems to import: no anatomiſt ſuppoſes, that the great veſſels, which iſſue from the left ſide of the heart, convey air, as the word artery implies: no theologiſt apprehends, that the ſubſtratum of all intellectual qualities is the breath of our noſtrils, as might be inferred from the appellation ſpirit. But what ſhould we ſay, if a ſet of reformiſts were ſeriouſly to propoſe baniſhing the words zodiac, artery, and ſpirit, from modern language, as tending to convey erroneous conceptions of things? In this inſtance, at leaſt, I ſhould coincide with the ſentiment handed down to us by Tully; "Errare mehercule malo "cum Platone, quam cum iſtis vera ſentire."

But the words, which have deſcended to us from antiquity, can, in general, adequately clothe, without diſguiſing our conceptions. Unlike the language of our modern ſyſtem-builders, they were conſtructed after archetypes of real exiſtences, not creatures of the imagination. They marked out ſubſtances by reference to ſome predominant quality, noted origin, cuſtomary uſe, or apt reſemblance; but they ſcarcely ever ſeemed to announce the real eſſences of things, or affected to be the warranty of facts wrought in the myſterious receſſes of nature.

In the ſcience of chemiſtry, however, it muſt be confeſſed, not many names of remote antiquity have reached us, without having ſuffered ſo much from the ruſt of age, that to attempt employing them in their primitive meaning would be an uſeleſs, or even a dangerous, experiment. Of ſome the ſenſe has been definitely and diametrically changed; as nitre, which once ſignified foſſil alkali, and now ſignifies nitrated vegetable alkali: of others the ſenſe has been ſo often and ſo looſely varied, that their original and ſucceſſive ſignifications cannot be aſcertained.

For example, the word *orichalcum*, or mountain copper (for I cannot agree with biſhop Watſon, in conſidering this word as an Hebræo-Grecian hybrid) originally denoted a native production, of which however ſo little was known in the days of Plato and Ariſtotle, that even its exiſtence was controverted. The former ſays, it was ονομαζομενον μονον: on the opinion of the latter we have the following comment by Apollonius;—Αριστοτελης δε εν τελεταις φησι μηδε υπαρχειν το ονομα, μηδε το τουτου ειδος· το γαρ ορειχαλκον ενιοι υπολαμβανουσι λεγεσθαι μεν, μη ειναι δε· τον δε εικη διαδεδομενων και τουτο, οι γαρ πολυπραγμονεστεροι φασιν αυτον υπαρχειν. (*Apollon. Scholiaſt.* l. iv, 973.) Pliny ſpeaking of this ſubſtance ſays, "Nec reperitur longo "jam tempore effœta tellure."—The word orichalcum, however, was familiar to the Romans in the Auguſtan age; and yet, notwithſtanding all the induſtry of ingenious critics, I conceive, that we are ſtill uncertain concerning its preciſe ſignification at that time. Biſhop Watſon (*Chemical Eſſays*, vol. iv) labours to prove, that it denoted a compoſition of zinc and copper, ſimilar to our braſs: but it ſeems more probable, that the word had then aſſumed a generic ſignification, and included ſubſtances of different ſpecies, totally diſſimilar in their external appearances: for Cicero intimates it to reſemble gold:—"Si quis, aurum vendens, "orichalcum ſe putet vendere, indicetne ei "vir bonus aurum illud eſſe, an emat denario "quod ſit mille denarium?" (*Off.* l. iii:) while Virgil explicitly deſcribes it as white—

> "Ipſe dehinc auro ſqualentem, alboque
> "orichalco
> "Circumdat loricam humeris."
> (*Æn.* xii, 87.)

Another curious example we have in ηλεκτρον, which was uſed in four decidedly different acceptations First, it ſignified cryſtal. Ariſtophanes ſays, that Homer, and the other old fellows of his day, did not know the word ὑαλον; Ὁμηρος ουκ οιδε το ονομα, αλλα παρ αυτω και τοις αρχαιοις ἠλεκτρος μεν εστιν. Secondly, it ſignified amber, which ſenſe the Latin electrum ſtill retains. Thirdly, it ſignified a compoſition conſiſting of gold and ſilver. Strabo ſays, μιγμα εχει αργυρου καὶ χρυσου; and Pliny, more circumſtantially, "Ubicunque quinta argenti "portio eſt, electrum vocatur." Fourthly, it had another ſignification, concerning which critics and antiquarians are yet at variance.

The prophet Ezekiel ſays, "I looked, and behold a whirlwind came out of the North, a great cloud and a fire infolding itſelf, and a brightneſs was about it, and out of the midſt thereof, as the colour of *amber* out of the midſt of the fire." The original is *haſmal*, which the Seventy tranſlate ηλεκτρον; and hence the blunder of amber ſhining in the midſt of the fire. It is plain that ηλεκτρον in this place can neither ſignify amber nor cryſtal; it muſt be ſome metallic ſubſtance. The learned Bochart takes pains to prove that it was orichalcum, in the ſenſe in which biſhop Watſon, after him, explains that word. But there is good reaſon to believe that it ſignified neither that, nor a mixture of gold and ſilver, but a peculiar metal. This is the proper ſignification of *haſmal*, and there are documents to juſtify the Seventy in tranſlating that word by ηλεκτρον. Natural electrum is mentioned by Pliny, Servius, and Iſidorus. Dionyſius Areopagita deſcribes this peculiar metal in rapturous terms:—Ὡς χρυσοειδες ϗ αργυροειδες, εμφαινει την ασηπτον ως εν χρυσω ϗ αδαπανον, ϗ αμειωτον, ϗ αχραντον διαυγειαν, ϗ την φανην ως εν αργυρον, ϗ̀ φώτοειδη, ϗ̀ ȣ̓ράνιαν αγλην. Origen and Hieronymus eſteem this electrum as more precious not only than ſilver, but than gold; and ſo indeed it ſhould be, independantly of its ſcarcity, if what Pliny ſays of it were true, "Quod eſt "nativum venena deprehendit." It was this valuable electrum which Heſiod intermingled with gold in the ſhield of Hercules, and to which Sophocles in his Antigone alludes, when he commends the Indian gold and Sardian electrum. But here a new inquiry ariſes—what was this rare and exquiſite metal? My object, however, is already anſwered, and I muſt beg leave to refer ſuch as delight in ſpeculations of this kind to Cortinovi's letters to Brugnatelli, in the 1ſt vol. of the Annali di Chimica of the latter, wherein the reverend father undertakes to prove, that the native electrum of the ancients was the identical platina, which their poſterity has been able to extract only from the new world.

To revive obſolete or retain equivocal expreſſions would only encumber or diſtract ſcience. Stores of this kind are not treaſures; and even the taſte of a virtuoſo muſt revolt from ſuch an indiſcriminate and inexpedient attachment to the reliques of antiquity. Neither can it be endured that ancient names, which have long ſlept in the tomb, ſhould be diſinterred, for the purpoſe of being again introduced into places occupied by well-known ſucceſſors.—There are, however, ſome ancient names, which can plead the title of preſcriptive right and uninterrupted ſucceſſion with unqueſtionable authority: ſuch are the names of certain metals, vinegar, ſalt, oil, ſoap, air, light, fire, and a few more.

But in matters of ſcience there is, if I may be allowed the expreſſion, an inferiour order of antiquity, which is entitled to our reſpect: and although the fathers of chemical ſcience did not live at a very remote period, it would be irreverent in us to violate their remains with licentious caprice.

It ſeems ſcarcely neceſſary for me to diſclaim intending any compliment to the memory of alchemiſts and roſicrucians. Experiments multiplied without plan or order, directed towards a vain and extravagant object, and detailed in the moſt myſterious metaphorical language, claim neither praiſe nor gratitude from the man of ſcience. But they who invented the modes of extracting their reſpective acids from vitriol, nitre, and ſalt; who combined the acids of the two latter, and diſcovered the principal virtues of the compound; who detected the acids of borax and tartar; who rendered the vegetable alkali cauſtic, and ſeparated the volatile alkali from ſal ammoniac; who prepared various pure alkaline and metallic neutral ſalts;—theſe were men without whoſe labours the ſcience of chemiſtry could not have exiſted, and to whoſe writings, therefore, reſpect is eminently due. The authority of the miniſters of the new light ſtands upon a footing materially different.

At the ſame time I am ready to allow, that our veneration for the language of even the fathers of chemiſtry ſhould never ſeduce us beyond the bounds of propriety. Hence I admit, with Bergmann, that ſome of their names, which are abſurd and idly oſtentatious, ought to be wholly rejected; ſuch as *the wonderful*, and *the ſecret ſalts of Glauber*, *the coralline arcanum*, *the duplicate arcanum*, *ſalt of two*, &c.: and that other names, which convey falſe implications, ought to experience the ſame fate; ſuch as *ſpirit of vitriol*, *oil of vitriol*, *oil of tartar*, *ſalt of tartar*, *foliated earth of tartar*, *butter of antimony*: to theſe may be added *cubic nitre* and *quadrangular nitre*, which falſely or imperfectly deſcribe the figure of the cryſtals of nitrated foſſil alkali; and which ſuggeſt that they contain the ſame alkali as nitre, or at leaſt leave it doubtful, whether the alkali or the acid be intimated. This laſt objection is alſo concluſive againſt the name *rhomboidal nitre*, although the epithet conveys a true deſcription of the figure of the ſaline cryſtals, which this name was invented to denote.

Theſe inſtances ſuffice to illuſtrate the general principles I deſire to eſtabliſh.

Let us uſe no word to which we do not annex a clear, diſtinct, and appropriate idea. If our forefathers have confounded ſubſtances, let us rectify their errour, and by preciſe nomenclature perpetuate juſt diſtinctions. If they knew a ſubſtance which has become for the firſt time the object of our examination, let us call it by that ancient name which of right belonged to it: if they knew it not, let us invent and annex to it a name which will not ſuggeſt wrong ideas of its nature. And ever let thoſe ſubſtances, concerning the homogeneouſneſs of which with theirs no doubt ſubſiſts, and which have been long and generally known by appropriate names, continue to retain the ſame badges of diſtinction which they have worn through ſucceſſive generations.

If we deſire to avoid obſcure and ambiguous redundance in our nomenclature, theſe are the arts we ſhould purſue. But if we give a looſe to the licentious ſpirit of innovation which is at preſent ſtalking abroad, chemiſtry will ſoon become a Babel, wherein every one will ſpeak his own language, and be unintelligible to his fellow-labourers.

## IV.

### NEW NAMES OUGHT NOT TO CONVEY HYPOTHETIC DISTINCTIONS.

A NOMENCLATURE tiſſued by expreſſions which import the exiſtence and operation of agents ſuppoſed, but not proved to exiſt, forms a conſiderable obſtruction to originality of thought, and fairneſs of diſquiſition. The ſtatement of the moſt ordinary facts in ſuch language ſerves as a prop to the hypotheſis couched in it; unleſs indeed the propoſition, taken in its hypothetical acceptation, ſhould be evidently abſurd, which, though the hypotheſis were ever ſo inconſiſtent, cannot always happen. Thus prejudice eſtabliſhes an empire, which is more hoſtile to ſcience than that of ignorance itſelf.

They who take the greateſt pains to think correctly are in perpetual danger of relapſing into errour, if they remit for a moment that exertion of mind, which is neceſſary to cauſe their ideas and their language to run in ſeparate channels. But they, to whom theſe painfully correct thinkers addreſs themſelves, will nevertheleſs believe what the expreſſions they hear import.

I ſhall exemplify this influence of language over conceptions. A diſciple of Lavoiſier, ſpeaking the language of the ſect of Stahl, tells his audience that atmoſpheric air may be phlogiſticated by the combuſtion of inflammable ſubſtances, and alſo by the ſolution of iron in dilute vitriolic acid. The orator underſtands that two very different proceſſes are expreſſed by the ſame word, phlogiſticating; but how are the perſons he inſtructs to apprehend, that in the former caſe ſomething is abſtracted from the atmoſpheric air, and in the latter caſe ſomething added to it?

In like manner a chemiſt of a different mode of thinking from the Frenchman, but alſo uſing a language founded on principles oppoſite to his own, affirms, that he has oxygenated muriatic acid, and oxyded iron and mercury, by diſtilling the firſt with manganeſe, by letting the ſecond ruſt, and by burning the third in atmoſpheric air. This philoſopher alſo underſtands, that each of thoſe ſubſtances, which he ſays he has oxygenated, or oxyded, has undergone a different kind of operation; but what will lead his audience to conſider this oxygenation or oxydation, in ſhort, this addition of acid-begetting matter, as rendering the firſt ſubſtance leſs acid, as denoting that the ſecond is combined with water, and the third with fixed air? Yet theſe are the ideas which he deſires to convey.

Thus it is that uſing the language of any hypotheſis

potheſis neceſſarily enliſts us under its banner, or at leaſt clothes our conceptions in its uniform, and implies to the apprehenſion of others our acquieſcence in its authority.

In piercing the unexplored regions of ſcience, or in diſcloſing them to thoſe whom we profeſs to guide, it is impoſſible for us to ſtop on every occaſion, and exorciſe thoſe phantoms of hypotheſis, which the ſpell of deceitful nomenclature is perpetually conjuring up to miſlead us. The philoſopher can ſcarcely think with freedom, who does not abjure a language which implies a confeſſion of faith in dogmas uneſtabliſhed by proof. The ſtudent will in vain attempt to ſteer a ſteady courſe, when the compaſs which he takes for his guide has a perpetual declination from the facts to which it profeſſes to point.

Having denounced the ſources from which new names ſhould not be deduced, I ſhall perhaps be aſked, whence ought they to ſpring? Are we to endeavour, in the moſt correct manner poſſible, to expreſs by apt compounds the eſſential nature or chief properties of the ſubſtances we deſire to denote? This has been, almoſt without exception, the object of modern nomenclators; but the confuſion, the diſputes, the errours they have introduced by this attempt, ſhould ſuffice to point out its impropriety. In fact, there never was a language, or could there be a language framed, capable of expreſſing the properties and real eſſences of things. It is futile therefore to look to this object; meanwhile the inevitable failure of our attempts impedes the progreſs of ſcience, and waſtes time without procuring the ſlighteſt advantage.

Amongſt the ancients, etymologies were, in general, aids to memory furniſhed by imagination. Figurative expreſſions were never ſuppoſed to convey the eſſential nature of objects; they were therefore never examined logically, or confided in expreſsly; and conſequently, they never miſled. Thus αηρ was derived from αημι; μεταλλον from μετ' αλλων. Modern etymologies ſhould be regulated in the ſame way. It is by no means neceſſary, that the etymological root of a new word ſhould yield a ſtrict account of the ſignification which we intend the word to convey. It will fulfil the end of its election if it intimate the truth; if it lead our thoughts to ſome principal object naturally aſſociated with that which we deſire to expreſs.

But perhaps no plan could be deviſed leſs objectionable for regulating the naming of new ſcientific objects, than to invent, in each inſtance, ſome ſhort and ſmooth name utterly deſtitute of relationſhip to any word in uſe: "Quum difficulter haberi queant nomina em-"phatica exacta, talia ſæpe præſtant quæ nihil "certi ſignificant, quorum ideo ſenſus defini-"tione ſtabilitur." (*Bergm. Opuſc.* iv. 259.) Had the diſcoverers of ſome of the aërial fluids denominated them on this principle, we ſhould in all probability have been preſerved from the inroad of a hoſt of barbarous names, which attempted to ſupplant the appellations conferred on them, and which, not a diſlike to the particular ſounds, but a diſagreement with the theory from which they ſprang, arrayed againſt the primitive denominations.

## V.

### NEW NAMES OUGHT TO ASSIMILATE WITH THE LANGUAGE INTO WHICH THEY ARE INTRODUCED, AND TO CORRESPOND WITH THE GENIUS OF THE LANGUAGES FROM WHICH THEY ARE RESPECTIVELY DERIVED.

In the converſion of any word from a foreign language into our own, we ſhould endeavour to accommodate the ſound of it to the general tenour of Engliſh ſounds. Such an aſſimilation ſhould at leaſt be attempted, wherever it can be done without ſo diſtorting the word as to diſguiſe its etymology. A certain uniformity of texture is indiſpenſably neceſſary to the durability as well as the beauty of a language.

‘ The language of ſcience not being a language apart, but a branch of that of the country, to which through it that ſcience is communicated, ſhould ſtrictly conform to its parent ſtock in all caſes where peculiar combinations of ideas do not, to be completely intelligible, call forth new appellations or modes of expreſſion; which ſhould alſo, as much as poſ-

‘ ſible, aſſimilate with the language already in uſe.

‘ Hence denominations utterly diſcrepant from the genius of our language, eſpecially if numerous and not abſolutely neceſſary, ſhould be rejected. The reaſon is, becauſe they in general defeat their own purpoſes. Sciences ſufficiently abound in real difficulties: nominal difficulties ſuperadded to theſe, tend to render them abſolutely inacceſſible. Of this we have ſufficient experience: I ſhall mention but two examples.

‘ Mr. Leibnitz has ſhewn that numerous advantages would flow from the ſubſtitution of binary arithmetic to the decimal ſyſtem now in uſe: others have diſplayed thoſe of a duodecimal; yet the preſent being already learned, and a number of operations performed in it, none would take the trouble of learning another abſolutely new, knowing that the old, containing ſo many excellent treatiſes, ſhould alſo be maſtered.

‘ So alſo the celebrated Rouſſeau invented a new and much more convenient ſyſtem of muſical notation; which, if in uſe, would ſu-

'perſede the labour of ſeveral months: but as
'the old ſyſtem ſhould alſo be acquired, elſe
'the accumulated treaſures of the old muſicians
'would remain for ever interdicted, his invention
'has been utterly diſregarded.

'Hence the denominations ſulfats, ſulfites,
'ſulfurets, borats, muriats, nitrats, nitrites, camphorats,
'oxalats, lactats, tartarites, &c., however
'ingeniouſly deviſed, ought to be baniſhed
'from our language. Chemiſtry, it is true,
'has tranſmitted to the Engliſh tongue a number
'of exotic words; but then they were gradually
'introduced, and, by long reſidence,
'have ſince been naturalized; whereas the
'aliens now objected to cannot plead preſcription,
'and are ſo numerous as utterly to deform
'the language.' *(Mr. Kirwan.)*

While we thus endeavour to erect barriers, to prevent our language from being over-run by the inroads of foreign invaders, we are not to forget, that new diſcoveries demand new words, and that we cannot, like the Germans, always, or even often, ſupply thoſe words from the native reſources of our Saxon ſtock. Such words as *fire-ſtuff*, *water-ſtuff*, *ſour-getter*, could never be tolerated in ſerious diſcourſe. We muſt therefore reſort to ſome other language for reinforcements.

But in the accommodation of foreign words to our uſe, we ſhould make no ſacrifices to ſound which might miſlead us with reſpect to ſignification. On this account, every word engrafted from a foreign tongue ought to bear the ſemblance of its parent ſtock.

In the firſt place, if the terminations of words in the ſeveral parts of ſpeech, in any language, be reſpectively peculiar to thoſe parts, the word to be derived from that language ſhould receive its deflection either from the original root, or from ſome peculiar modification of it, according as either expreſſes the preciſe ſenſe that correſponds with the ſenſe we deſire to convey in our new word.

To exemplify this obſervation, behold an inſtance where a word ought to have been derived from the original root, but is improperly from a modification of it; the renowned *phlogiſton*. Stahl ſhould have deduced his word from the genitive of φλοξ, like the phlogites of Pliny, whereas it flows from the future of φλογιζω,

*t* being

τ being introduced into it by epentheſis, ſo that the proper ſignification of phlogiſton is a principle, not of inflammability, but of cauſticity.

Of a name being derived from a wrong modification of the theme, we have an inſtance in *zoolith*, a word invented by Dr. Hopſon to expreſs calculous concretion of animal origin; but which, being derived from the ſubſtantive ζωον, or the adjective ζωος, with λιθος, truly ſignifies a ſtone that is an animal, or a living ſtone. The firſt part of the compound ought to have been formed from ζωικος, or ζωοδης, which do not import animality, but relation to animals, as ζωικη ιστορια; and the word ſhould have been zöikolith, or zöodolith.

Secondly, if we form a compound word of words taken from any language, the compoſition ſhould be made according to the uſage of that language in ſimilar inſtances.

An example of tranſgreſſion againſt this rule is exhibited in the adjective dephlogiſticated, invented by Dr. Prieſtley to characterize a ſpecies of air which he conſidered as devoid of phlogiſton. The word phlogiſton being of

Greek extraction, demanded a Greek privative; Dr. Prieſtley ſhould therefore have termed his air aphlogiſticated, as we ſay apathy, atony, &c. The prepoſitive particle *de* is deduced from the Latin tongue, where it ſeldom imports privation, often contrariety, but moſt generally augmentation. In Engliſh, words derived from Latin with *de* retain the ſame ſignification; as we ſee in declaim, debaſe, denominate, debauch, denote, depict, deplore, devote, depurate, dedicate, depoſit. Contrariety or privation is ſometimes, indeed, indicated in Engliſh by *de*, but generally by *dis*, or *un*.

The word *decompound* has ſuffered a perverſion of meaning, which appears to have ariſen from a neglect or ignorance of the genius of the language whence it is derived. To decompound, properly ſignifies to compoſe of things already compounded, not to reſolve a compound into ſimple parts. This latter, Dr. Johnſon obſerves, is a ſenſe which has of late crept irregularly into chemical books; and he quotes Boyle, Locke, and Newton, who uſe this word in its proper acceptation.

Thirdly, the barbarous licence of fabricating a new word by combining heterogeneous materials deduced from different tongues ſhould ſcarcely ever be aſſumed.

Inſtances of theſe hybrid productions, which are an outrage againſt philological decorum, abound in the language of modern chemiſtry: even the very ſcheme of reform, which the French have juſt delineated, is polluted by ſuch monſters in nomenclature, as would have diſgraced a committee of monks in the darkeſt ages—*pyrolignic! pyromucic! carbonohydric!*

To this general rule of not permitting different languages to coaleſce in the formation of a compound word, it muſt, however, be acknowledged, that ſome exceptions are admiſſible. Where a word derived from any language has been rendered ſo familiar by frequent uſe in another, that it is completely naturalized, that word may without impropriety be combined with one of the language into which it has been tranſplanted. Thus *ſaccharum*, though of Greek extraction, appears ſo thoroughly latinized, that the compound *ſaclactic* ſeems more eligible, as it is more ſmooth, than *ſacgalic*. So alſo the termination *logy*, derived from the

Greek, occurs frequently, eſpecially in the ſcientific department of our language: and *mineral*, from the Italian, is with us quite domeſticated. The word *mineralogy*, therefore, which is obviouſly agreeable to analogy, and readily intelligible, is not only juſtifiable, but even preferable to the recondite term *orictology*.

Fourthly, In the tranſplantation of foreign words into our language regard ſhould be had to their primitive orthography.

The tranſgreſſion of this rule, though a minor fault, ought to be avoided, ſince it muſt tend to throw additional obſcurity over etymologies. The common mode of writing *ſulphur* would lead us to ſuppoſe that word of Greek deſcent, becauſe the Romans never uſed *ph*, except as a tranſlation of the Greek φ. It ought therefore to be written by us, as it was by the people from whom it derives its origin, *ſulfur*.

The French *oxigene* appears to be derived from οξις, a cruet, not from οξυς; for the Greek υ is univerſally rendered in modern languages, after the example of the Romans, by *y*. We ſhould therefore write *oxygen*.

Chemiſts almoſt always write *hydrargyrus*, but erroneouſly: we ſhould write *hydrargyrum*, the word being derived from ιδϱως and αϱγυϱος, and Pliny having ſet the example of converting the maſculine Greek into a neuter Latin termination, agreeably to analogy with the Latin names of other metals.

In the ſtructure of languages, analogy is the inſeparable companion of elegance and propriety. The uſe of language is to convey ideas with preciſion and quickneſs: deviations in form imply deviations in eſſence; if, therefore, the implications of language be obſcure or falſe, the apprehenſion will be at default, and the communication of ideas will be neither accurate nor prompt.

## VI.

### NEW NAMES OUGHT TO BE DERIVED FROM THE LATIN, IN PREFERENCE TO ANY OTHER FOREIGN LANGUAGE.

This rule is equally as applicable to the French as to our language; for to both the Latin is more congenial than the Greek. It is true our tongue has naturalized ſounds which are natives of various others; ſo that words are to be found in it derived from almoſt all the modern living languages, as well as from the ancient. But the genius of the Engliſh language was begotten by the old Gothic upon the Gallic Roman.

When the Saxons coaleſced with the conquering Normans, an intermixture of languages was eſtabliſhed, which produced the genuine ſpirit of the Engliſh tongue, ſuch as it ſubſiſts even at the preſent day. To the Saxon, which was a dialect of the Gothic or Teutonic, our language principally owes its form, and even much of its grace; for ſtill the Saxon ſounds predominate in it, and are perhaps the moſt grateful to a Britiſh ear: but to the Norman it is indebted for much of its ſubſtance, its copiouſneſs, and its energy. The followers of William the Conqueror had long reſided in Gaul. Their anceſtors, the Franks and Normans, had ſubdued that country, and repoſing in it after their victories, had ſate down with the inhabitants, and participated their language with their other treaſures. This language, which was called *Romanſhe*, was the Latin of the Roman ſettlers in Gaul, contaminated by a portion of the ancient Celtic of the natives. Thus did French and Latin ſounds become familiar in Britain.

So that, we ſee, the Saxon and the Latin are the original ſources, from the united ſtreams of which our language flowed. That ſuch new acceſſions as it needs ſhould be in general elicited from either of the ſame ſprings, analogy of ſtructure and uniformity of enunciation, which have place in every well cultivated language, inexorably enjoin. How uncouth and diſſonant to an Engliſh ear are thoſe ſounds with which a certain modern chemiſt has propoſed to enrich our language; *baralithioxyc*, *zöolithoxyc*, *oxalidicrate*, *elextroxian*, *galameliticratian*, *xyloxian*, *oxymuriorcite*, *bombycicrate* * !

> "Cetera de genere hoc longum 'ſt ſi dicere coner."

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* To thoſe "earthly god-fathers of Heaven's" compounds, who admire the Greek language ſo much, on account of the extraordinary facility with which it admits the formation of compoſite names, I recommend the ſtudy and imitation of the following valuable ſpecimen from Ariſtophanes:—

Λοπαδοτεμαχοσελαχοκρανιολειψανοδριμυποτριμματοσιλφιοπαραομελιτοκατακεχυμενοκιγκλεπικοσσυφοπεριστεραλεκτρυονοπτερεκεφαλλιονιγκλοπελειολαγωοσιραιοβαφητραγανοπτερυγων.

It is the duty of philology to interpoſe for the welfare of mankind, and to ſnatch this hideous and deterring maſk from the viſage of philoſophy. Strip off her outlandiſh garb, and let her appear in chemiſtry as ſhe did in the other departments of ſcience, when ſhe called forth that rapturous apoſtrophe of our moſt learned, as well as moſt ſublime poet:

> "How charming is divine Philoſophy!
> "Not harſh or crabbed, as dull fools ſuppoſe,
> "But muſical as is Apollo's lute,
> "And a perpetual feaſt of nectar'd ſweets
> "Where no crude ſurfeit reigns!"

After having firſt attended to our own language, which is naturally entitled to our chief regard, our next attention ſhould be turned to that, by means of which the intercourſe of the learned in different parts of the world is moſt generally upheld. The claim of the Latin language is of a ſimilar nature with that of our own; and higher, though not more binding upon us. The Greek tongue does not, in general, coaleſce with the Latin without ſome degree of violence. Horace, it is true, allows credit to new words drawn from the Grecian fount: but he did ſo merely becauſe Greece was the mother of arts and the miſtreſs of elegance, in compariſon of whom all other nations appeared to the eye of Roman urbanity ſo barbarous, that to adopt even a word from them would be diſgraceful. The unneceſſary introduction of Greek words, however, he pointedly ridicules. Speaking of Lucilius, whoſe bilingual mode of writing reſembled the mongrel dialect of Canuſium, yet, it ſeems, was not without its admirers, he ſays,

> " At magnum fecit quod verbis Græca Latinis
> " Miſcuit. O ſeri ſtudiorum!"

Cicero alſo, it may be obſerved, has ſanctioned by example the precept of the didactic poet, having introduced many entire Greek words, and ſome of Greek extraction, into his philoſophical diſquiſitions. True, he has done ſo, but evidently with reluctance, aware of the force of his own comment, " Orator, modo ſit " elegans, nec in faciendis verbis erit audax,

" & in transferendis verecundus, & parcus." *(De Orat.)*—He conſiders theſe foreign words as tarniſhing the luſtre of his native tongue; he repeatedly apologizes for the uſe of them, and laments that he cannot without circumlocution expreſs in his own language the ideas he had imbibed under the portico of the Pœcile, or in the gardens of the Lyceum or the Academy. But though he ſometimes ſeeks in vain for a Latin word equivalent to its archetype in Greek, "verbum Latinum par Græco, " & quod idem valeat;" yet in ſeveral inſtances he tranſlates with boldneſs and ſucceſs, keeping cloſe to the idea, but neglecting all ſimilarity of ſound: " Egone non intelligo quid " ſit ἡδονη Græcè, Latinè voluptas?" *(De Finib.* lib. ii.)—" Percepta apello quæ dicuntur Græcè " θεωρηματα." *(de Fato.)*—" Iſtam καταληψιν, " quam verbum e verbo exprimentes compre- " henſionem dicemus," &c.

Laſtly, Lucretius, though ſkilled in the ſcience of the age, and partially fond of Grecian theories, with which he richly illuminated his brilliant poem, choſe upon ſome occaſions rather to forego the inveſtigation of abſtruſe cauſes, than to impair the purity and elegance of his language by tranſplanting into it words deduced from the Greek.

> "Rationem reddere aventem
> "Abſtrahit invitum patrii ſermonis egeſtas."

And he ſtigmatizes with the cenſure of blind affectation thoſe pretenders to extraordinary refinement, who took every occaſion of employing Grecian phraſes, in preference to thoſe which their own language ſupplied:

> "Nam hoc faciunt homines plerumque cupidine cœci,
> "Et tribuunt ea quæ non ſunt his commoda verè."

In fine, though I venerate the genius, and admire the taſte, which dignified and adorned the accompliſhed inhabitants of antient Greece, I am of opinion, that their language ſhould not be generally reſorted to for reinforcements of technical nomenclature, in preference to that with which our own has ſo ſtrong an affinity, that which has for ages been the general language of philoſophers, that of which Tully's aſſertion is as true at this day, over all the realms of poliſhed ſociety, as it was originally in the city of

Rome, "Non enim tam præclarum eſt ſcire Latinè quam turpe neſcire."

This opinion is fortified, and even further extended, by the ſagacious Bergmann, who wiſhed that the augmentations of chemical nomenclature ſhould be derived from the Latin, not only in thoſe languages which have a peculiar affinity with it, but univerſally. "In ſtabiliendis nimirum novis nominibus, ut a Latinis initium fieret opto. Eſt hæc lingua, vel "ſaltem fuit, eruditorum vernacula: jam mortua quoque nullis quotidianis eſt obnoxia mutationibus. Si igitur in hac primum reformatio peragitur, in vivis poſtea ad eundem "modulum, quantum genius cujuſlibet permiſerit, eadem facilius perficietur. Hoc ipſo "lingua chemica ubique locorum generalem "adquirere poteſt convenientiam; quod non "tantum in legendis exterorum operibus, ſed "etiam in transferendis haud exiguam pollicetur "utilitatem." (*Opuſc.* iv. 270.)

The neglect of this ſalutary advice has given riſe to a groſs philological impropriety. The new technical terms of chemiſtry not having been derived from the Latin tongue excluſively, or nearly ſo, but indiſcriminately from the Greek, Arabic, German, and Dutch, as well as the Latin; thoſe names, which in a living language may be tolerable, when transferred into Latin, over which we have ſo much leſs controul, render it completely barbarous. With oxygenium, pyromucicum, karabe, potaſſinum, and gas, what a language have ye conſtructed, claſſical reformers!

"Tyber would tremble underneath her banks
"To hear the replication of your ſounds
"Made in her concave ſhores,"

What I have ſaid of the preference which is juſtly due to the Latin above any other foreign language, in our application for philoſophical reſources, is not, however, to be underſtood without limitation or exception. Other languages may occaſionally lay claim to a preference from having firſt or eminently diſtinguiſhed any particular objects of thought, eſpecially if thoſe objects have been much contemplated under their names. Thus Cicero, ſpeaking of the Sorites: "Soriti—quem, ſi neceſſe "ſit, Latino verbo liceat acervalem appellare:

" ſed nihil opus eſt; ut enim ipſa philoſophia, " & multa verba Gæcorum, ſic Sorites ſatis Latino ſermone tritus eſt." (*De Divinat.* lib. ii. c. 4.)

On this principle we prefer, on the one hand, ſome more ancient names to ſynonyms of later date, as arſenic to orpiment, or golden pigment; metallic calx to metallic lime, or oxyd; and, on the other hand, ſome modern names to ancient ſynonyms, as zinc to climia; and even antimony, notwithſtanding its ridiculous derivation*, to any word deduced from *ϛιμμι*, or *ſtibium*.

Here it deſerves to be remarked, that ſome words outlive the ideas originally aſſociated with them, and form new connections of a very different ſtamp. Antimony is a word of this kind, which has been ſo much employed in grave writings, that at preſent it never excites mirth, except in the mind of an etymologiſt.

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* Bergmann is not pleaſed at the common report; " Quod " autem experimentis minus felici ſucceſſu in monachis " ſuæ [Baſilii Valentini] ſocietatis inſtitutis, occaſionem " illud antimonium, quaſi antimonachale, nominandi de" derit, falſò a nonnullis perhibetur, quum ipſe hac deno" minatione utatur." (*Opuſc.* iv. 100.)

It happens in other inſtances, that certain words, for which the philoſopher may have occaſion, are, in the language which he uſes, aſſociated with ideas of vulgarity or diſguſt. In theſe caſes it is neceſſary for him, in order to preſerve the ſerious tenor of his diſcourſe, to reſort to ſome other language for expreſſions not contaminated by ſuch aſſociations.

Thus a phyſician may very properly write a treatiſe in Engliſh, upon urine, ſaliva, or mucus; though he would fall into inevitable and deſerved deriſion, if he were to treat of thoſe excretions by the only names for them which the Engliſh language furniſhes.

The propriety of avoiding ſuch ridiculous aſſociations of ideas frequently renders it neceſſary for us, to reſort to a dead language in preference to our vernacular tongue, when we form compound words, although thoſe words might be conſtructed even more eaſily with our own than with foreign materials. We ſhould throw an air of burleſque over the whole ſcience, if, in imitation of the Germans, we were to denominate the ſuppoſed matter of fire *warm-ſtuff*, of light *light-ſtuff*, oxygen *ſour-ſtuff*, phlogiſton *water-ſtuff*, mephite *ſaltpetre-ſtuff*, carbone *coal-ſtuff*, &c.

To ſum up the whole of what has been ſaid, the language of chemiſtry is to be reformed, augmented, and preſerved by maintaining a cautious reſerve in the admiſſion of ſynonyms; by avoiding the application of the ſame names to ſubſtances of different ſorts; by retaining ancient and popular names where they are adequate to the purpoſes of ſcience; by applying new names to ſuch nominal eſſences only as are faithfully copied from nature; and by conſtructing theſe names agreeably to the principles of claſſical taſte.

## CHAPTER II.

## NAMES *of* CHEMICAL PRINCIPLES.

### § 1. *DENOMINATION OF CHEMICAL PRINCIPLES IN GENERAL.*

CERTAIN changes wrought in bodies we can frequently eſtimate with ſufficient accuracy by the changes obſervable in their properties, though we cannot aſcertain whether the nature of thoſe changes conſiſts in the addition or avolation of a peculiar ſubſtance, or in an alteration of the affinities or modes of motion of identical particles. Until this knowledge be conſummate, it is uſeful to have a word which ſhall denote the unknown cauſe of thoſe changes, without affecting to determine its nature. To this purpoſe chemiſts employ the word *principle*. Thus the caloric principle, or fire, according to ſome, is a peculiar ſubſtance; according to others, a peculiar motion of the ſame particles, which under other circumſtances are cold. The phlogiſtic principle alſo, according to ſome, is a peculiar ſubſtance; according to others, inflammable air, the particles of which are condenſed. Chemical principles, then, are cauſes of which the nature is not determined, and even the exiſtence not known, except by inference that a number of ſimilar phænomena manifeſt in bodies ſubjected to our ſenſes muſt be owing to the operation of an homogeneous cauſe.

The chief of thoſe at preſent known are gravity, electricity, magnetiſm, fire, light, phlogiſton, oxygen, mephite, and carbone.

### § 2. *GRAVITY.*

THE earth is probably an heterogeneous ellipſoid; in conſequence of which conſtruction, the varieties of the force of GRAVITY obſerved in different latitudes are reconcileable to thoſe general laws of motion, by which we have reaſon to believe that all the bodies in the univerſe are governed.

### § 3, 4. *ELECTRICITY and MAGNETISM.*

The phænomena of electricity and magnetism have been tolerably well reduced to order, and referred to general laws, which regard their reſpective attractions and repulſions.

Concerning the nomenclature of theſe principles, and their modifications, there is no difficulty. But of the reſt, which are more obſcure, or have been more miſunderſtood, to adjuſt the nomenclature we muſt enter ſomewhat more into detail.

### § 5. *FIRE.*

By fire I underſtand the cauſe of the ſenſations of heat, or of thoſe other phænomena which we know by experience would be commenſurate with our ſenſations, if the ſuſceptibility of our feelings were unvaried, and the conſtitutions of different bodies were alike.

Fire has been very often underſtood as the eſſential cauſe of the ſenſation of light, as well as of heat: for in moſt caſes where we have a perception of light iſſuing from a body, we know by experience that we ſhould feel heat by approaching that body. Hence mankind has generally conſidered light and heat as effects of the ſame cauſe: and as in the caſe of light there is apparently a material meſſenger iſſuing from the luminous body, and entering into thoſe organs by means of which we enjoy the ſenſation of light; ſo in the caſe of heat it has been moſtly ſuppoſed that a ſubſtance of a peculiar kind iſſues from the hot body, and enters into thoſe organs by means of which we experience the ſenſation of heat.

But it is the duty of the philoſopher to ſeparate ideas, which have been aſſociated by the vulgar without ſufficient reaſon. There are many bodies (ſuch as the moon, phoſphoric ſubſtances, the glow-worm) which are highly luminous, but incapable of exciting the ſlighteſt degree of heat, even though their light ſhould be ſo concentrated as to become vivid. It is therefore indiſputable, that the matter which, applied to the optic nerves, produces the ſenſation of light, is not the immediate cauſe of the ſenſation of heat.

The other poſition, that the immediate or exciting cauſe of heat is a peculiar kind of fluid, has not been eſtabliſhed by ſatisfactory proof. It has been controverted by natural philoſophers of the firſt rank, particularly by the philoſopher of the higheſt authority in phyſics; and I am ſatisfied that it is not, as ſome imagine, eſſentially neceſſary to the conſtruction of an intelligible and conſiſtent theory of chemiſtry.

In ſpeaking of fire, therefore, we ought to conſider it merely as the cauſe of certain phænomena, without taking upon us to determine its nature; in like manner as when we ſpeak of the Supreme Being, we conſider him as the cauſe of all things, without attempting to form any conception of his nature. Hence when we reaſon about fire, it is not neceſſary that we ſhould always take into account the ſubject in which the quality of exciting the ſenſation of heat is inherent. When we ſay the fire warms us, we attend ſolely to the cauſe of our ſenſations; nay, when we particularize the fire by concrete terms, as a coal fire, a wood fire, the commoneſt underſtanding apprehends that there is no difference in the cauſe of our ſenſations proceeding from ignited coal and from ignited wood, but merely that the action of that cauſe under different circumſtances is thus denoted by different collateral effects, viz. the combuſtion of coal and of wood.

Even amongſt the mechanical philoſophers, ſir Iſaac Newton ſtands almoſt alone in taking into account, in the definition of fire, the ſubject itſelf, as well as the quality which is the main object of our contemplation. "Is not "fire," ſays he, "a body heated ſo hot as to "emit light copiouſly? For what elſe is red "hot iron than fire; and what elſe is a burning "coal than red hot wood?" (*Optics*, query 9.)

This great man might have perhaps conceived that philoſophical preciſion required of him, in defining the cauſe of any of our ſenſations, to affirm it to be a body of ſome kind or other, in a certain ſtate.

It is indeed undeniable, that all ſenſation is effected by the operation of material cauſes: but where the nature of ſeveral cauſes is ſo far homogeneous as to produce ſenſations not different in kind, but only in degree, it is obviouſly uſeful and ſcientific to conſider abſtractedly this homogeneous nature, omitting the conſideration of the heterogeneous qualities that are adſcititious and uneſſential. There is, therefore, no neceſſity for including in our definition of the term fire any other than the abſtract idea of that cauſe, of which the moſt eminent effect is heat.

Hence alſo it follows, that the diſtinction of fire, which ſome have made into ſolar, culinary, and elementary, is no way ſubſervient to the purpoſes of ſcience. The ſame object of conception preſents itſelf uniformly in different combinations. Its ſituation only is varied; not its eſſence, or its power.

We now proceed to conſiderations of greater intricacy. The principle, from the influence of which our ſenſation of heat ariſes, may remain unvaried; yet different circumſtances under which it may happen to exiſt, or by which it may be accompanied, may ſo modify our ſenſations, or controul our organs, that the effects wrought on our bodies may not correſpond to the effects which would be wrought by the operation of the ſame extrinſic cauſe of heat, under other circumſtances. In theſe caſes it is neceſſary to relinquiſh the guidance of mere ſenſe, and appeal to reaſon. We muſt illuſtrate thoſe judicious comments of Olympiodorus the Platonic (the whole of which literature regrets are only to be found in manuſcript): Ουδεποτε γαρ τα χειρω ϗ δευτερα αρχαι η αιτιαι εισι των κρειττονων: ει δε δει ϗ ταις εγκυκλιοις εξηγησεσι πειθεσθαι, ϗ αρχην ειπειν την αισθησιν της επιϛημης, λεξομεν αυτην αρχην ȣχ ως ποιητικην, αλλ' ως ερεθιζȣσαν την ημετεραν ψυχην εις αναμνησιν των καθολȣ. “Things inferior and ſe“condary are by no means to be eſteemed as “main principles and cauſes; for though we “admit uſual interpretations, and allow ſenſe “to be a principle of ſcience, we muſt how“ever call it a principle, not as if it were an ef“ficient cauſe, but as it rouſes the ſoul to the “formation of general conceptions.” Where the teſtimonies of ſenſe, and the influences of reaſon, do not coincide concerning heat and its cauſe; where it is neceſſary to eſtimate the actual energy of fire by other circumſtances beſide ſenſible or obvious temperature; there, if the context of our diſcourſe do not denote the particular circumſtance which we wiſh to be taken additionally into conſideration, we muſt add ſuch epithets to the characteriſtic name as may identify and fix attention on thoſe circumſtances.

The energies of fire, or the caloric principle, in different bodies, may correſpond with their ſenſible temperatures on different accounts. Firſt, the ſtate of the nerves of touch in different perſons, or even of different nerves in the ſame perſon, may be ſo various as to intimate a variety of temperatures in the ſame body; which variety is really impoſſible. Inſtead of truſting to our ſenſations, therefore, we eſtimate the fire cognizable by our ſenſes by an inſtrument which meaſures the changes of the extrinſic cauſe or principle of heat ſo faithfully and ſo ſteadily, that it would correſpond with our ſenſations if our ſenſibility were unvaried. The thermometer may therefore be always ſubſtituted in lieu of our ſenſations of feeling; ſo that the temperature intimated by that inſtrument may be termed ſenſible heat, and the cauſe of this heat SENSIBLE FIRE.

Secondly, a body may contain within itſelf a principle which would operate as a power, but that it is coërced by ſome counterbalancing principle, eſſential to the body's peculiar contingent ſtate, but not to its actual conſtitution. There is a principle in certain bodies which would operate ſo as to produce ſenſible heat, but that it is cöerced by a counterbalancing power. This principle, in its ſtate of cöercion, may be called LATENT FIRE, or the latent principle of heat; and the counterbalancing power which preſerves it ſo, may be called the peculiar CAPACITY of that body for containing latent fire, or the principle of heat.

Thirdly, as it appears that the manifeſtation of fire depends partly on the variable ſtate of human ſenſibility, and partly upon the variable ſtate of heated bodies, with regard to their capacities for containing latent fire, it is evident that there actually exiſts a principle, the poſitive energy of which is not aſcertained by the menſuration either of ſenſible or of latent fire. If then we deſire to expreſs this principle, this eſſential and primary cauſe, without having relation either to its ſenſible effects, or to the degree of cöercion it may ſuſtain from the peculiar capacities of bodies, we may call it ABSOLUTE FIRE.

Theſe terms ſenſible fire, latent fire, and abſolute fire, correſpond to the *ſenſible heat*, *latent heat*, and *abſolute heat* of Dr. Crawford. Abſolute fire is alſo ſynonymous with the *calorique* *ſpecifique* of M. Seguin. Latent fire is ſynonymous with the *chaleur ſpecifique* of M.M. Lavoiſier and De la Place; and with the *calorique ſpecifique* of the former, as he ſometimes uſes it in his Abregè de la Chimie. Senſible fire is the *calorique libre* of M. Seguin. The *calorique interpoſé* and *calorique combiné* of the latter philoſopher are expreſſions founded on hypotheſis; the former expreſſes the igneous fluid ſuppoſed to be interpoſed between the conſtituent particles of a body, and which counteracts their affinity of aggregation; the latter the igneous fluid ſuppoſed to be chemically combined with the conſtituent particles. Theſe taken together are a body's latent fire.

The word fire has been uniformly employed in the tranſlation of *ignis* into our language, and with perfect propriety; ſince the Latin word appears to have been uſed by the ancients in the ſame ſenſe, and even preciſely with the ſame force. *Ignis*, like fire (as I have juſt explained it), ſometimes affects the ſenſes, but ſometimes alſo exiſts in a latent ſtate. This fact, though firſt proved by our illuſtrious contemporary Dr. Black, was not unimagined by ancient philoſophers.

loſophers. Lucretius uſes the very words "in-"ſitus ignis;" and in another part of his work thus elegantly propounds his ingenious hypotheſis:

> "Forſitan & roſea ſol alte lampade lucens
> "Poſſideat multum, cœcis fervoribus, ignem
> "Circum ſe, nullo qui ſit fulgore notatus."

The word *heat* properly ſignifies the ſenſation we feel in the propinquity or contact of hot bodies. Often, however, in ordinary converſation, and even ſometimes in ſtrict philoſophical inveſtigations, the ſame word has been employed to denote the cauſe of this ſenſation. Thus a philoſpher of the firſt rank applied the denomination latent heat to the cauſe of that principle in certain bodies, which is ſo counteracted by their peculiar conſtitution, that they poſſeſs an inferior power of affecting our ſenſes, to the power which other bodies poſſeſs in ſimilar circumſtances.

This application of the word *heat* is not, however, ſtrictly warrantable: for philoſophical language ought to diſcriminate between our ſenſations and their cauſes; and one of our ſenſations has a prior claim, which in nomenclature is an excluſive right, to the word heat. The ſame body applied to different nerves of touch differently circumſtanced may appear at the ſame time hot, warm, cool, and cold; the extrinſic cauſe, however, which excited theſe various ſenſations will be unvaried; there ſhould, therefore, be an appropriate name applied to that cauſe, which name ſhould be different from that whereby we expreſs one of its effects.

M. Lavoiſier, aware of theſe objections, denoted the cauſe of heat at firſt by the names *igneous fluid* and *matter of heat*; and afterwards, in conjunction with Meſſrs. Guyton, Berthollet, and Fourcroy, by the word *calorique*, or as we tranſlate it, caloric. The former names, which import that the cauſe of heat is a peculiar ſubſtance, are manifeſtly objectionable, as being founded on hypotheſis, which, however plauſible, ought never to bear any ſway in ſcientific nomenclature.

Of the name calorique M. Lavoiſier gives this commendation, that beſide fulfilling his object in the ſyſtem he ſupports, it poſſeſſes the advantage of according with every ſpecies of opinion, ſince, ſtrictly ſpeaking, we are not obliged to ſuppoſe calorique to be a real ſubſtance; it being ſufficient if we conſider it as the cauſe, whatever it may be, which ſeparates the particles of matter from each other; ſo that we may ſtill be at liberty to inveſtigate its effects mathematically.

I paſs over ſuch objections as I think might be made to the Anglified word *caloric*, on account of its reſemblance in ſtructure to an adjective formed from calor, as I deſire to avoid the appearance of being hypercritical: but I object to this word on the ſtrong ground of its being unneceſſary, and therefore an incumbrance. The idea which the French chemiſts profeſs to affix to it being properly and adequately conveyed by the word fire, or by thoſe words in other languages which correſpond to our fire; and the objections to the uſe of fire, from the corrupt conceptions that have been frequently attached to it, lying as forcibly againſt caloric, from the uſage of the very perſons who have introduced that term.

However guardedly philoſophers may ſpeak of fire, when their thoughts are bent on ſteering clear of hypotheſis, yet it muſt be acknowledged that in their ordinary diſcourſe they ſpeak as if they held it to be a real ſubſtance. The French chemiſts almoſt always ſpeak of their caloric after the ſame manner; inſomuch, that although M. Lavoiſier had expreſsly reſerved his aſſent on this head, for the ſake of preventing an important objection to his new word, yet it is impoſſible not to conclude from the general tenor of his, no leſs than that of all his coadjutors' diſcourſe, that by caloric is to be underſtood a particular kind of fluid.

M. Lavoiſier, ſpeaking of caloric in his very firſt chapter, ſays, "This ſubtile matter penetrates through the pores of all known ſubſtances." He afterwards ſpeaks of caloric having ſo great an adheſion to our ſyſtem that we cannot obtain it free; of its paſſing from one body into another; of its particles being elaſtic, and having a ſtronger mutual attraction than thoſe of any other ſubſtance.

M. Fourcroy obſerves, in his explanation of the doctrine of caloric, that when a bar of iron is ſtricken, the ſtroke compreſſes its particles,

ticles," and cauſes the caloric to iſſue out, in the ſame manner as water iſſues from a wet ſponge when it is ſqueezed.

And M. Chaptal declares, that the phænomenon of the change of temperature, which takes place when two or more bodies unite by the affinity of compoſition, cannot be explained but by conſidering the caloric or fluid of heat, as a conſtituent principle of bodies, and unequally diſtributed amongſt them.

Thus it appears, after all, that this caloric has contributed nothing to the caution of philoſophic language.

### § 6. *LIGHT.*

THE word light has two ſignifications. It means the ſenſation ariſing from the view of luminous bodies; and it alſo means the cauſe of that ſenſation. In this latter ſenſe it is to be underſtood as denoting a chemical principle.

Whether this principle be a ſubſtance of a peculiar kind emitted from luminous bodies, and impinging on, or penetrating into the organ of viſion; or whether it be only a peculiar vibratory, or other ſpecies of corpuſcular motion which the particles of luminous bodies communicate to the atmoſphere, or to ſome conſtituent part of it, and which is thus propagated to the optic nerves, we are yet unable by concluſive evidence to determine. In the preſent ſtate of our knowledge, therefore, we may conſider light as a principle productive of the ſenſations of viſion, without intending any deciſion concerning its real eſſence.

## § 7. *PHLOGISTON.*

Beccher laid the foundation of the phlogiſtic ſect. His philoſophy appears to have been an ingenious combination of the mechanical and chemical opinions concerning fire. He conſidered fire as an effect of matter in motion; but he held one particular ſpecies of matter only to be capable of thoſe motions whereby fire is excited. This matter he ſuppoſed to be united by chemical affinity to various ſubſtances, in different proportions, correſpondent to their reſpective degrees of inflammability. From theſe conſiderations he was led to call this particular kind of matter *inflammable earth*.

Contemplating Beccher's theory according to the principles of mechanical philoſophy, we perceive in it great beauty, ſimplicity, and veriſimilitude. The power of exciting heat depends upon certain motions of material particles. Either all material particles are equally capable of theſe motions, or they are not. If they be, all bodies muſt be equally inflammable: but this is not the caſe; therefore certain particles of matter are peculiarly capable of thoſe motions, which we denominate fire. The more any body abounds with theſe particles, the more inflammable it muſt be, and converſely. Laſtly, thoſe particles, collectively conſidered, may as well be diſtinguiſhed by the name of inflammable earth as by any other.

The phlogiſton of Stahl was grounded upon different views of the nature of fire. He followed Beccher in attributing the inflammability of bodies to their being in poſſeſſion of an inflammable principle; but conſidering fire as a peculiar kind of matter, he held that this matter may exiſt, either in an uncombined ſtate, or incorporated with other ſubſtances. The flame which we behold, and which warms us, he ſuppoſed to be pure, uncombined fire. The ſame ſubſtance held in durance by the chemical attraction of the other particles of bodies, renders theſe bodies combuſtible. Its liberation from them occaſions the phænomena of inflammation.

From theſe views it follows, that the principle of inflammability, although material, could not conſiſtently be called inflammable earth; ſince this principle is not, ſtrictly ſpeaking, an earthy matter capable of producing flame, but the actual ſubſtance of flame itſelf, not eſſentially altered by its union with other ſubſtances, but reſtrained from exciting the ſenſation of heat. Hence was deviſed the name of phlogiſton, which appears to have been intended to ſignify exactly the ſame idea as the "abſcondita "flamma" of the Romans.

The principle of inflammability then, according to Beccher, is a ſuſceptibility in certain particles of being ſo affected as to excite in us the ſenſation of heat; according to Stahl, it is a ſyſtem of particles capable of being diſlodged from others by which their peculiar qualities are coerced, and of exciting in us during their ſeparate ſtate the ſenſations of heat and of light.

To both theories there are in common an ultimate effect and a proximate cauſe; a ſenſation, and an impreſſion on our nerves of certain particles capable of producing this ſenſation. This impreſſion of particles on our nerves, which is the proximate cauſe of all we know concerning fire, muſt be mechanical. Beccher ſays, that theſe particles are the burning body; Stahl ſays, that they are emanations from the burning body.

To Stahl's theory it is peculiar that there are two ultimate effects combined, and one proximate cauſe of both. Two ſenſations which coexiſt, heat and perception of light, are produced by the impreſſion upon different nerves of homogeneous particles iſſuing from the burning body.

In Stahl's doctrine the following gratuitous poſtulates are aſſumed:

Firſt, That the cauſe of heat is a fluid of a peculiar kind.

This is an aſſumption which remains yet to be proved.

Secondly, It is aſſumed that this fluid, extricated from other bodies, and impinging upon our nerves, occaſions the ſenſation of (the perception of) light, as well as the ſenſation of heat.

This, however, is not true: for heat may be excited by bodies which make no impreſſion upon the optic nerves; light may be diffuſed from objects which intimate no change of temperature to the nerves of touch; and of ſuch ſubſtances as are both hot and luminous, the temperature and light do not preſerve any conſtant ratio.

Thirdly, It is aſſumed that this fluid, in proportion as it enters into combination with other bodies, renders them inflammable.

Let us conſider this poſtulate, allowing Stahl's ſuppoſition, that fire is a fluid.

In the firſt place, it is undiſputed, that when a body paſſes from a ſolid to a fluid ſtate, or from a fluid to a vaporous ſtate, it robs the ſurrounding bodies of fire, without its own temperature being augmented. This fire, therefore, as it loſes its peculiar energies, muſt enter into chemical combination with the body to which it unites, and conſequently muſt render that body proportionably inflammable. It is, therefore, univerſally true, upon this hypotheſis, that bodies become inflammable in proportion as the diminution of their denſity effects a change in their form.

In refutation of this concluſion, it is ſufficient to remark, that ſteam is not more inflammable than water, or water than ice.

In the next place, it is known, that bodies of equal bulk, but of different texture, acquire different temperatures from expoſure to the ſame cauſes of heat. Different quantities of fire, therefore, enter into combination with bodies of different kinds; and conſequently, by Stahl's poſtulate, render theſe bodies proportionably inflammable. It is, therefore, univerſally true, upon this hypotheſis, that the inflammability of all bodies is proportional to their capacities of coercing fire; or, according to a more uſual, but incorrect mode of ſpeech, to their capacities for containing latent heat.

The accurate experiments of Dr. Crawford ſufficiently refute this concluſion. His "Table of Comparative Heats," in which ſubſtances are arranged according to their power of coercing fire, is a mere jumble, if reſpect be had only to their inflammability.

Fourthly, It is aſſumed that the combuſtion of inflammable bodies, and the calcination of metals, are nothing more than the extrication of combined fire, and the conſequent reduction of the ſubſtances from which it eſcapes to the claſs of incombuſtibles.

That ſome other effect beſide the extrication of combined fire is wrought in combuſtion, appears from the weight of the incombuſtible reſidue being greater than that of the inflammable body before inflammation.

That the extrication of combined fire does not form an eſſential ſtep in the proceſs of calcination, appears from the comparative capacities of ruſt, ruſt nearly freed from adventitious air, and iron, which are as 2500, 1666, and 1269.

Fifthly, It is aſſumed that the avolation of combined fire from bodies during combuſtion is effected ſolely by the influx into thoſe bodies of uncombined fire.

That is to ſay, the attraction ſubſiſting between two ſubſtances is deſtroyed by preſenting to the compound an additional quantity of one of them; a poſition repugnant to the fundamental laws of chemiſtry, and to common ſenſe; for the force with which two ſubſtances unite chemically is the ſurplus of the force of combination of both above the forces of aggregation of both; it is evident, therefore, that their union cannot be deſtroyed but by a force greater than the force of aggregation of one of the component parts.

We proceed now to enquire what ideas were afterwards bound in the magic ſpell of the word phlogiſton.

The more ſagacious followers of Stahl, ſenſible that ſome of his poſitions were untenable, renounced by degrees ſuch as appeared not eſſential to the main doctrine. They firſt relinquiſhed the ſuppoſition of the identity of the cauſes of heat and light. In conſequence of this, they could no longer maintain that flame is pure, uncombined fire; they confined themſelves, therefore, to the ſuppoſition that fire may exiſt in bodies after a two-fold manner, free, and combined. In the former way, it paſſes readily from one body to another, occaſioning correſpondent changes in their temperatures; and in this ſtate it is properly called fire. In the latter way, it forms a conſtituent principle of combuſtible bodies, by means of which they are enabled to conceive flame; and in this point of view, ſaid they, it is ſtill entitled to the name phlogiſton.

From this change of doctrine it follows, that fire, inſtead of exiſting ſeparately an object of ſenſe, cannot be obtained pure and ſingle; but is always combined either with certain bodies not luminous, called inflammable, or with the particles of light, as in the ſolar rays, flame, and other ignited ſubſtances.

In this ſtate was the doctrine of phlogiſton left by the learned Macquer, and by his no leſs learned Engliſh tranſlator, in the year 1777. Of the numerous errors and abſurdities of the original, one only was corrected.

The next alteration which the followers of Stahl wrought in his hypotheſis was a dereliction of his grand, fundamental tenet, of the identity of phlogiſton and fire. The advantages acquired by deſerting this poſt were very conſiderable.

ſiderable. It could no longer be objected to them that the inflammability of bodies has no dependance on their change of form, no connection with their capacity of coercing fire, or that the capacity of the calces of metals may be greater than that of the metals themſelves.

Thus far the generality of Phlogiſtians went hand in hand. But it was neceſſary to mould their doctrine ſtill more, to adapt it to the phænomena of nature. By diſuniting the eſſences of fire and phlogiſton, the utmoſt ſcope was afforded to fancy to deviſe criterions for their diſcrimination. The cutting off of this one hydra head gave occaſion to the ſprouting up of a thouſand, more fantaſtical than the original, if poſſible, and more dangerous to ſcience. Electricity, magnetiſm, light, a ſuppoſed æther, and various combinations of theſe with one another, had each its partizans; who, as whim, ignorance, or enthuſiaſm inſtigated, clamoured to crown their viſionary favourite with the diadem of phlogiſton. The moſt inconſiſtent and incomprehenſible jargon polluted the pages of chemiſtry. Phlogiſton became the watch-word of ſcientific ſedition, at the ſound of which ſuch a rabble a rabble of unſettled terms and confuſed arguments inceſſantly poured forth, as put all rational ideas to flight.

Amidſt this anarchy, two or three leaders of ſuperior talents aroſe, and endeavoured to reduce the phlogiſtic ſyſtem to preciſion and order. Of theſe the moſt diſtinguiſhed, as an ingenious reaſoner, a profound chemiſt, and a candid man, was Mr. Kirwan.

Phlogiſton, according to the theory which he propounded, is pure inflammable air. He avoided aſſuming with Stahl, that the combuſtion of inflammable bodies, and the calcination of metals, are effected ſolely by the extrication of phlogiſton from theſe ſubſtances. On the contrary, he held that either fixed air or water enters into them; by the adoption of which tenet he alſo avoided aſſuming, with Stahl, that phlogiſton may be ſeparated from inflammable bodies without the interpoſition of any other matters for which theſe bodies have a ſuperior attraction.

This ſyſtem of Mr. Kirwan's is, in ſome important points, not far removed from a dereliction of the hypotheſis of phlogiſton. It was allowed in common by him and his opponents, that oxygen enters into and becomes fixed in bodies during their combuſtion or calcination. Concerning the manner in which this combination is effected, ſome difference of opinion ſubſiſted; but the main fact appears to be repreſented alike by both. The Antiphlogiſtians affirm, that the only change wrought in the conſtitution of bodies by combuſtion or calcination, is the incorporation of oxygen with them. Mr. Kirwan contended, that the calces of metals held in union either water or fixed air; both of theſe ſubſtances, however, he ſuppoſed to be conſtituted of oxygen and phlogiſton: now as phlogiſton, by the hypotheſis, formed a part of the metal before calcination, it follows, that the only change wrought in the conſtitution of bodies by calcination, is the incorporation of oxygen with them. Thus phlogiſton was of no uſe in explaining the phænomena of calcination, and was only preſerved for the ſake of conſiſtency in the theory of the adjunct parts of this new-modelled ſyſtem.

To enquire more deeply into the value of thoſe ingenious contrivances, by which Mr. Kirwan decorated, and for a while ſupported this tottering hypotheſis, would be deviating too far from my preſent purpoſe; more eſpecially as this able and candid philoſopher has himſelf abandoned it. His theory of phlogiſton underwent a regular ſiege from a phalanx of the moſt formidable antagoniſts that chemical philoſophy ever muſtered: their aſſaults were made with vigour, and repelled with dexterity; and it is, perhaps, not leſs to the glory of all parties, than to the intereſts of ſcience, that he has at length capitulated, and marched out of a fortreſs no longer tenable with all the honours of war.

But even before this event, the other defenders of phlogiſton refuſed to "riſque their "cauſe with the fate of any ſingle champion." They acknowledged themſelves "to reſemble "irregular troops, fighting with various arms, "and deſultory attacks, and not unfrequently "claſhing with each other." (*Kier's Dict.* 136.) They nearly avowed that their ſtrength lies in their numbers, and their ſecurity in their evaſions. How are ſuch foes to be engaged? If any of theſe Parthian heroes can be provoked to regular combat, then, and then only, can we fairly eſtimate his prowefs.

Sometimes, perhaps, we may advantageouſly abridge the labour of controverſy by giving an author "leave to foil himſelf," and permitting him to achieve his own refutation. I ſhall endeavour to ſhew, by a particular inſtance, how this may be effected, and for that purpoſe ſhall ſelect a theoriſt of no vulgar note.

Dr. Hutton (in "Diſſertations on different Subjects of Natural Philoſophy," 1793,) enters the liſts profeſſedly to defend the traduced name and character of phlogiſton. He ſays, "the doctrine of phlogiſton may be conſidered "as implying that a quantity of the matter of "light and heat is occaſionally contained in "bodies as a part of their compoſition; and "that thoſe phlogiſtic bodies poſſeſs this naturally diffuſive ſubſtance upon a different principle from that of heat, or any other beſides "this, which is peculiar to itſelf."

In this account of the doctrine of phlogiſton, (which Dr. Hutton is little ſolicitous "how "far it was preciſely the idea of the chemiſts "who firſt introduced that term, or of thoſe "who have ſince miſapplied it,") the following poſitions are obſervable:

Firſt, That there exiſts in certain bodies a naturally diffuſive ſubſtance, which is the matter of light and heat.

Secondly, That there alſo exiſts in certain bodies another ſubſtance, which is the matter of heat only.

Thirdly, That the ſame bodies poſſeſs both thoſe ſubſtances upon a different principle.

He then gives us to underſtand, that "the "union of the matter of light and heat with "ſome of the other chemical ſubſtances of bodies, is that which is termed a phlogiſtic ſubſtance in his Diſſertation," (p. 175.)

Now, in p. 190–1, he ſays, "that a modification of the ſolar ſubſtance of light (which "is not any modification of heat, though a "cauſe of heat) is an unknown principle, "which may, with the utmoſt propriety, be "termed a phlogiſtic ſubſtance, before its emiſſion from thoſe äeriform bodies with which "it is combined, as it is certainly fire the moment it is ſet at liberty, or eſcapes from its "confinement."

Here we obſerve, firſt, that the ſolar ſubſtance undergoes a modification by which it becomes light; ſecondly, that light is a phlogiſtic ſubſtance; wherefore we are furniſhed, (by means of page 171) with the following luminous definition of light:—"Light is the matter of "light and heat, in union with ſome of the other "chemical ſubſtances of the ſolar ſubſtance, "combined with an äeriform body."—Laſtly, the whole affair is completely cleared up in pages 190 and 191; where we are informed, that light "is the cauſe of the production of light and "heat," and that this heat or "fire is light ſet "at liberty!"

But it may be ſaid, phlogiſton is not deſtitute of ſupporters who ſpeak intelligibly and conſiſtently. Let us reſort, therefore, to the moſt juſtly eminent of this party.

The Phlogiſtians found it neceſſary to deny a main point, inſiſted on by their antagoniſts, and admitted by Mr. Kirwan, concerning the compoſition of water. According to them, "not merely water, but alſo nitrous acid is "produced by combining pure (or oxygen) "and inflammable airs."—See Mr. Kier's Dictionary of Chemiſtry, and Dr. Prieſtley's "Experiments relating to the Decompoſition of Dephlogiſticated and Inflammable Airs."

Mr. Kier, who may be ſingled out as one of the chief leaders of the phlogiſtic ſect, affirms that nitrous acid is a compound of oxygen and phlogiſton; that this is the only pure and proper acid in nature, all the others being compoſed of the ſame materials, united to peculiar baſes, by which they are modified ſo as to conſtitute, according to the particular nature of each baſe, the reſpective acids denominated vitriolic, muriatic, phoſphoric, and ſo forth; that this phlogiſton is either pure inflammable air, or inflammable air combined with water; that according as either phlogiſton is ſubtracted from, or oxygen added to any inflammable ſubſtance, that ſubſtance is rendered incombuſtible; and that this proceſs effected rapidly, with the aid of fire, produces the phænomena of combuſtion; ſlowly, with or without that aid, the dephlogiſtication of acids (or rather the acidification of the baſes of acids,) and the calcination of metals. *(See Dict. of Chem. article Nitrous Acid.)*

Satisfactory proof of this theory, he himſelf owns, does not exiſt. Of what particulars ſuch proof ſhould conſiſt, he fairly ſtates in the following manner: *(p. 123.)* If inflammable airs ſhould be obtained from ſulfur, phoſphorus, charcoal, metals, and all other combuſtible bodies; and if theſe airs, when cleanſed from their accidental impurities, ſhould each form the ſame ſubſtance, nitrous acid, by combination with oxygen, theſe different inflammable airs muſt contain the ſame principle, whatever be the bodies from which they may have been procured; and this identical matter is what the chemiſts call phlogiſton.

In this outline of Mr. Kier's hypotheſis the following prominent features ſtrike the eye.

Firſt, it is advanced that into the compoſition of all acids, except the nitrous, there enter, beſide oxygen, "certain unknown and ſuppoſed "baſes," (which, by the by, he elſewhere caſts in the teeth of the antiphlogiſtians, as being hypothetic ſubſtances) and furthermore phlogiſton; that all inflammable bodies are compoſed of ſimilar unknown baſes, of different kinds, according to their reſpective natures, and phlogiſton; and that "univerſally the ad-"dition of phlogiſton is equivalent, with re-"gard to the changes operated on theſe ſub-"ſtances, to the ſubtraction of air," (that is vital air or oxygen) "and converſely." *(p. 123.)*

Hence it follows, firſt, that, if we ſuppoſe all acids and inflammable bodies poſſeſſed of a certain immutable portion of phlogiſton, the dephlogiſticating (as theſe theoriſts call it) of the one, and the calcining or rendering incombuſtible of the other, will be proportional to the quantities of oxygen reſpectively conjoined to them, without any regard to their quantity of phlogiſton; and in like manner, the phlogiſticating (as they term it) of acids, the revivifying of metals, and the rendering inflammable of ſubſtances capable of being made combuſtible, will be proportional to the quanties of oxygen reſpectively ſubtracted from them, without any regard to their quantity of phlogiſton. Now the actual addition or ſubtraction

traction of oxygen in theſe ſeveral caſes is rendered probable by ſuch evidence as, at the preſent period of chemical knowledge, no one can refuſe to admit. Mr. Kier acknowledges this to be tantamount to the ſubtraction or addition of phlogiſton. The ſuppoſition of phlogiſton, therefore, in any caſe is uſeleſs; and conſequently, where its exiſtence is not directly proved, improper; for "more cauſes of natural "things are not to be admitted, than are both "true and ſufficient to explain the phænome- "na." (*Newton Regulæ Philoſoph.*)

Secondly, it is advanced, that oxygen air and inflammable air combined conſtitute nitrous acid. (*Dict. p.* 114.)

Here it is proper to obſerve that many diſtinguiſhed chemiſts, as well of the phlogiſtic as of the antiphlogiſtic ſect, affirm, that when the oxygen air employed in admixture with inflammable air is perfectly pure (which is not to be procured without much nicety and care) water only is obtained.

Mr. Kier admits (*Dict. p.* 119.) "that it "may be difficult to diſprove the poſſibility of "the formation of water, from ſome propor-

" tion of oxygen and inflammable airs;" he, therefore, concludes "that water is either not " compounded of theſe airs, or that it is ſo " only in a certain proportion of theſe ingre- " dients, while another proportion yields ni- " trous acid." This is the fundamental poſition whereon Mr. Kier's doctrine of phlogiſton reſts; a poſition in itſelf indeterminate, and therefore inconcluſive; couching a ſuppoſed fact, which is unſupported by ſatisfactory evidence, contravened by high authority, and therefore at beſt but ſuſpicious.

Thirdly, it is advanced "that inflammable " air may be extricated from all inflammable " bodies."—This aſſertion is ſtrenuouſly denied by a multitude of chemiſts.

Finally, it is allowed by Mr. Kier himſelf, that even ſhould thoſe diſputes concerning fundamental facts be terminated in his favour, the exiſtence of phlogiſton cannot ſtill be deduced from a copious induction of conſpiring facts; which all philoſophers acknowledge to be the only concluſive kind of argument in phyſics.

Upon the whole, then, until it be eſtabliſhed that two cauſes may exiſt in nature of the different ſtates of acids, combuſtible bodies and metals, both true, and both ſufficient to explain theſe phænomena; until it be proved that pure oxygen and inflammable airs combined conſtitute nitrous acid; until it be proved that inflammable air may be extricated from all acids, inflammable ſubſtances, and metals; finally, until experiments be adduced by which theſe facts can be generalized, ſo that an homogeneous ſubſtance drawn from every combuſtible body, and united with oxygen air, ſhall be exhibited conſtituting nitrous acid; the exiſtence of phlogiſton, even on Mr. Kier's principles, is but hypothetical, the aſſumption of the name in his ſenſe upon any occaſion gratuitous, its employment in chemical language illogical, and its application to facts unwarrantable and deceptive.

The territories of knowledge are not to be extended by letting looſe the myrmidons of fancy, to wave their banners in the wilds of ſuppoſition. The forces of reaſon muſt, indeed, be marſhalled and led on by inventive genius, but they ſhould proceed through thoſe paſſes only which the faithful pioneers of ſcience, cautious experimenters, have laid open for their route. If the vague and hypothetical notions hitherto denoted by the term phlogiſton were agreed to be exchanged for a preciſe idea, I readily grant that there is no miſchievous magic in the word itſelf, and that it might be retained in chemical language, not only innocently but profitably. On this head hear Mr. Kirwan: 'As *flame* denotes the appearance of light and 'heat in a fluid form, it was, until of late, in'ferred that theſe appearances muſt have pro'ceeded from one ſingle principle, which was, 'on that account, denominated *the inflammable* 'or *phlogiſtic principle*, or more ſhortly *phlogiſton*. 'A multitude of phænomena conſpired to pro'duce the belief that this principle was united 'to metallic ſubſtances in their metallic ſtate, 'to various acids, and of courſe to all inflam'mable ſubſtances. It has however been diſ'covered, by means of more perfect methods 'of analyſis, and a ſevere attention to the di'miniſhed or increaſed weights of the ſub'ſtances employed, that flame in *many* caſes 'proceeds from vital or oxygen air *ſingly*, and 'can in no caſe be produced without it; and

‘ in *other* caſes from an air of a totally different ‘ nature, incapable of ſupporting animal life, ‘ and many degrees lighter, conjointly with vital ‘ air, or atmoſpheric air as partially containing ‘ vital air. This air was of old called inflam‘ mable air, when it was the only air that was ‘ know to exhibit the phænomena of flame. ‘ But having been found to poſſeſs another ex‘ traordinary property, namely that of being the ‘ baſis or one of the conſtituent parts of water, ‘ this property being leſs ambiguous was ſe‘ lected as the foundation of its denomination, ‘ and it was therefore called *hydrogenous gas.* ‘ The reaſons for introducing this new denomi‘ nation muſt be allowed to have great weight, ‘ yet they do not appear to me ſufficient to in‘ duce us to baniſh the denominations already ‘ in uſe. The term inflammable air can at ‘ preſent appear ambiguous only to thoſe who ‘ are perfectly ignorant of the ſubject; and the ‘ term PHLOGISTON may ſtill expreſs inflam‘ mable air in a concrete ſtate, for which ſub‘ ſtance in that ſtate we ſhould, otherwiſe, have ‘ no denomination.’

The term *hydrogene*, introduced by the French chemiſts to expreſs this idea, contradicts all analogy. They intended it to expreſs the water-generating principle, in like manner as they meant oxigene to expreſs the acid-generating principle. Now granting their theoretic principles to be juſt, no ſuch conſequence follows as their nomenclature implies. Oxigene, according to them, by union with various ſubſtances termed radicals, generates a progeny termed acids. But with what ſubſtances is hydrogene by a ſimilar union enabled to generate water? I am anſwered with oxigene alone. Then I reply, this ſubſtance ſhould have been claſſed with the other radicals. It is not capable of generating, but ſuſceptible of being converted into water: It ought to have been called in the new vocabulary, the *hydric radical.*

This is an obſervation which I can ſcarcely conceive to have been overlooked by the French chemiſts; and if it had not appeared too extravagant a catachreſis to call water a ſpecies of acid, I think we ſhould never have heard of this hydrogene. But as water is decidedly not acid, the admiſſion of an hydric radical would have carried with it, either an open impeachment of the propriety of their language, or an indirect attack upon the truth of their ſyſtem.

Of Dr. Hopſon's propoſed denomination *hydrophloge*, little need be remarked. If it announce any ſubſtance diſtinctly, it muſt be a ſpecies of pyrophorus.

### § 8. *OXYGEN.*

The eſſential principle of vital air was denominated, by the confederate eureſiepiſts of France, *oxigene*. This word caſts a characteriſtic hue over their whole nomenclature, ſo that it is entitled to eſpecial attention. It is derived, as we are informed, "du Grec οξυς, *acide*, "et γεινομαι, *j'engendre*, à cauſe de la propriété "bien conſtante de ce principe, baſe de l'air "vital, de porter un grand nombre de ſub"ſtances, avec leſquelles il s'unit, à l'état "d'acide; ou plutot, parce qu'il paroit être un "principe neceſſaire à l'acidité." (*Encyc. Meth. Chym.* i. 640.)

This name errs much againſt the rules of nomenclature, which I have endeavoured to eſtabliſh. In the firſt place it is deduced from the Greek language, for the preference of which to the Latin in this inſtance no reaſon appears. A compound equally expreſſive of the ſame idea, more obvious in its etymology, and much ſmoother in ſound, might have been readily formed from the Latin. In the next place, this new name has not been legitimately deduced from the Greek. Oxigene, as I have already remarked, muſt trace its origin to οξις, a cruet, not to οξυς. But if this error be corrected, and we write oxygen, I ſay it is an old word uſurped in a new and unwarrantable ſignification. The Greek word οξυγενυς, which may be rendered in French or Engliſh oxygen, properly ſignifies *ſharp chin*, or as lexicographers chooſe to explain it, "id quod infra labra in maxilla infe- "riore eminet," being compounded of οξυς and γενυς.—How would the ſhade of Lucian be ſolaced, could the language, in which this word occupies ſo diſtinguiſhed a place, find its way from the Elyſian fields of Paris to thoſe of Erebus!

It may be urged, however, that the ſame word oxygen would equally correſpond to a word that might have found place in the Grecian language, had there been occaſion for the combination,

bination, namely οξυγενης, or οξυγενος.—Let this be granted, and let us ſee what would be the ſignification of this word, according to the genius of the Greek tongue.

Οξυς literally ſignifies ſharp or acute, and does not ſignify acid, except figuratively. Γενης and γενος always indicate deſcent; and all compound words, the ultimate conſtituent parts of which are derivatives from γεινω or γεινομαι, invariably aſſume a paſſive ſignification. Οξυγενης or οξυγενος therefore, in this point of view, can ſcarcely be allowed any determinate ſignification. What can we make of ſharp-deſcended, or ſprung from an edge?

But οξυς, it may be ſaid, was uſed by the Greeks, in combination, to ſignify acid alſo. It was ſo, though indeed very rarely, not in above five or ſix inſtances, for it generally indicated ſome other metaphorical meaning, or elſe vinegar. Theſe few inſtances however, I grant, are ſufficient to form a precedent: but what then? Oxygen, after all, ſignifies the *deſcendant* of an acid; whereas the inventors of this name intended and announced it to ſignify the *begetter* of acids.

To illuſtrate farther the nature of this etymology, let us conſider how a native of Greece would have conſtructed a word to ſignify the parent of acids. Either γεινω ſhould take the lead in the compoſition, or if this could not be done with ſufficient regard to *euphony*, the word expreſſive of generation ſhould be derived from the preterite γεγονα, or from the noun γονη or γονος; ſuch words only in the Greek language, and even theſe not often, implying action or power when placed in the ſecond part of a compound. The Greek adjective *directly* correſponding to our acid is οξωδης, that *metaphorically* correſponding οξυς. The compound of a Grecian philologiſt would therefore have been, if γεινω took the lead, either γεινοξωδης, perhaps contracted to γεινοξος, according to the general tendency of the Greek, eſpecially of the Attic dialect, to contraction; or elſe γεινοξυς: if οξυς took the lead, ΟΞΥΓΟΝΟΣ, like Ανδρογονος, Θηλυγονος, Πολυγονος, &c.

The juſtneſs of theſe criticiſms is illuſtrated and proved by a caſe directly in point. Πυριγενης ſignifies *ſprung from* fire: Τοκεων πυριγενει τεμνειν παλαμα χροα. *(Eurip. in Oreſt.)* Πυριγονος ſignifies *generating* fire: Της γης φυσιν πυριγονον εχȣσης. (*Plut. Alex.*) The nomenclators ſhould therefore, undoubtedly, have denominated this principle *oxygon*, not *oxigene*.

We ſee how ſpurious in the line of claſſical genealogy this oxigene is: let us now examine its philoſophical pretenſions.

Do the embraces of this begetter of acids always prove fruitful? We are told that oxigene is united to the matter of fire without generating an acid, to the baſis of water * without generating an acid, to moſt of the metals without generating an obvious and evolved acid; nay, that when ſuperadded to acids themſelves, it deſpoils them of part of their acidity. Who then are the heads of the acid families? Surely the baſes of theſe acids, without which no acid could be produced. Theſe are the true Οξυγονοι: vital air is but the matrix which they impregnate.

As this oxigene, therefore, is ſcarcely acidi-

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* According to the French chemiſts oxygene conſtitutes 0,85 of water, though but 0,72 of fixed air, and but 0,70 of nitrous acid.

fying

ſying to more than one claſs of ſubſtances; though it is capable of uniting with a conſiderable number, and as the ſubſtances even of this claſs are not acidified in proportion to the quantity of it combined with them, the neologiſts, by the introduction of this term into their nomenclature, are compelled to be ſoleciſtical; they acidify fire, the baſis of water, and various metals, without rendering them acid, and they render acids leſs acid by acidifying them.

Theſe abſurdities have ariſen from a partial and inſufficient view of the operations of nature having been conſidered as a complete inſight into her works. A leading property has been miſtaken for an univerſal one, and a name deduced from a contingent and ſubordinate circumſtance has been attached to a principle, as if it were expreſſive of its fundamental power. Doubtleſs there exiſts, though it be yet unexplored, one general property of this principle, in conſequence of which it converts phlogiſton into water, and acid radicals into acids, renders acids leſs acid, gives metals an avidity to combine with acids, ſuperadds cauſticity to metallic ſalts, and ſupplies almoſt univerſally its pabulum to fire. It is only from a comprehenſive conſideration of theſe ſeveral powers, and a reference of them all to one general law, that a name can be diſcovered for this principle truly expreſſive of its eſſential nature.

But until ſcience receive this augmentation, the principle of which we are treating is not to remain nameleſs. Nor is it of much conſequence by what name we diſtinguiſh it, provided that the name we employ does not intimate a greater degree of knowledge than we really poſſeſs, and thus tend to controul farther inquiry. This objection lies againſt oxigene, taken in the ſenſe which M. Lavoiſier and his coadjutors intended. But I have ſhewn that etymology will not bear them out in affixing to it the ſenſe of *acidifier*. Oxygen truly ſignifies *acid-ſprung*; and in this ſenſe the word, although of Greek deſcent, may be retained in chemical language; ſince it has already acquired conſiderable celebrity, and rightly interpreted has no tendency to miſlead us with regard to the nature of the principle it denotes. I have already obſerved that names deduced from the origin of ſubſtances are preferable to thoſe which affect to expound their nature. The ſame poſition is true of principles, and the word oxygen does in fact but identify a particular principle, by pointing out one copious ſource whence it may be elicited.

Oxygen has been frequently termed the *principle of acidity*, and the *acidifying principle*, but with how little propriety muſt be obvious from the preceding remarks. There is one power or property common to all acid radicals; that power is the real principle of acidity: to confer this name on oxygen which merely miniſters to its manifeſtation, is as prepoſterous as if we ſhould call money the principle of liberality, or the liberalizing principle.

The other names invented to denote this principle may be diſmiſſed in a few words. M. d'Areluja's *archekaion* (or an incendiary principle, different from the inflammable principle) originated from partial conceptions, and leads to an erroneous inference. That it contributes to combuſtion is but one of the properties of this principle, and the principle itſelf is no more combuſtible than it is acid.

Laſtly, Dr. Lubbock's "principium ſorbile" or *principle that may be ſupped up*, is a title which cannot be conſidered as characteriſtic of this principle, while the voracious elements are every moment making a meal of ſo many others.

## § 9. *MEPHITE.*

THE word *mephitis* was originally Etruſcan. When adopted into the Roman language, it ſignified a noiſome exhalation: thus Virgil, ſpeaking of the valley of Amſanctus, ſays, "ſævam-"que exhalat opaca mephitim." The name is therefore ſufficiently claſſical; at the ſame time that its application to that conſtituent part of the atmoſphere, which is comparatively unfriendly to the human frame, is not indefenſible in a philoſophical point of view, ſince this principle appears to be a grand agent in the conſtitution of ungrateful odours and peſtilential miaſmata.

The word *moffette* was much in uſe on the continent, to denote THE MEPHITIC PRINCIPLE, before the introduction of the new nomenclature; and Mr. Kirwan thinks that it may properly be exchanged in Engliſh for the term *mephite.*

Concerning mephite, two points are controverted that may tend to affect this name. Firſt, the exiſtence of any ſuch ſimple principle is denied by Dr. Prieſtley, who conſiders mephitic air as a combination of phlogiſton and oxygen. (*Expts. on the Decomp. of dephlog. and inflam. Air, p.* 19 *and* 20.) If this opinion ſhould eventually be eſtabliſhed, the name mephite muſt certainly be given up, or at leaſt removed from the liſt of chemical principles, ſince it would denote a complex idea reſolvable into thoſe of phlogiſton and oxygen. But the theory of Dr. Prieſtley does not yet appear poſſeſſed of ſufficient weight or conſiſtency, to induce us to aboliſh this term. This philoſopher affirms, that inflammable air, by being mixed with oxygen air, becomes, according as the proportion of the latter ingredient is increaſed, mephitic air, fixed air, water, or nitrous acid. But in the firſt place, the reſult of experiments ſimilar to thoſe of Dr. Prieſtley, concerning the combuſtion of inflammable and oxygen airs, made by Meſſrs. Lavoiſier, Briſſon, Meuſnier, and la Place, and afterwards by Meſſrs. Van Trooſtwyk and Deiman, with accurate inſtruments and due precautions, was different from that of his. Secondly, there appears ſomewhat of contradiction in the accounts of his own experiments; for in the above-mentioned work, p. 14, he relates an experiment wherein he ſays, it is moſt evident that an acid was produced by the exploſion of a mixture of two parts of inflammable, and ſomething more than one part of oxygen air; yet in p. 17 he ſays he conſtantly obſerves that if there be a ſurplus of inflammable air, the reſult of the exploſion is ſimply water. Thirdly, if his theory were true, water ought to be generated from a certain proportion of mephitic and oxygen airs, and alſo from a certain proportion of fixed and oxygen airs, neither of which proceſſes Dr. Prieſtley, nor any one elſe, has been able to effect. Hence it appears that we have ſufficient reaſon for reſerving our aſſent, with regard to the compoſition of mephite; and that until its compoſition be fully eſtabliſhed, it is right to regard and denominate it as a ſimple principle.

The other point relating to this principle yet

undecided,

undecided, is whether there be any ſubſtantial difference between it and mephitic air. If fire be a quality only, not a ſubſtance, there is not: yet the term mephite may ſtill be uſeful to denote this matter in its concrete or confined ſtate.

Notwithſtanding the aptitude and general reception of the term already in uſe among the French, the rage for revolution of the confederate reformiſts was not to be appeaſed without its condemnation, and the old cabaliſtic *azote* was ſought out to ſupplant it. But why ſhould the principle of mephitic air be characteriſtically entitled azote? Is there any ſpecies of pure aeriform fluid not azotic to mankind? None, not even "empyreal air without Urania's tem-"pering." Thus do theſe admirers of the metaphyſical Condillac characterize a particular ſpecies by an epithet equally applicable to every other of the ſame genus! But farther, the eſſential principle of this ſpecies of air is not even univerſally, or preeminently azotic. Not univerſally, for "inſects of various kinds live per-"fectly well in air tainted with animal or ve-"getable putrefaction;" (*Pr.* i. 85. *1ſt ed.*)

and plants grow more vigorouſly in air much mephitized, than in common air. (*Senebier Mem. Phyſico-Chym.* ii. 143.) Not preeminently, for though certain inſects live a long time in different airs, they inſtantly die in ſulfureous and muriatic airs, and in nitrous vapour: (*Beckenheim, Ann. de Chym.* iv. 19.) and the ſame is true of vegetables.

Again, why prefer denominating the eſſential principle of this air from one of its leading qualities in preference to another? It is more unfavourable to combuſtion than to reſpiration, and even more peculiarly ſo, ſince in no inſtance does it contribute to combuſtion, while other airs, which are yet more deleterious, do. Why not therefore entitle it the *apyric principle*, which it is univerſally, rather than the azotic, which it is but partially?

From a conſideration of ſome other circumſtances, which are alſo not without weight; the incongruity of the name azote, or any modification of it, with the concrete and fixed ſubſtance, which fire is ſuppoſed to convert into mephitic air, for in this ſtate the principles of all the airs are eſſentially azotes; and the impropriety

propriety of affixing to a radical a denomination which cannot enter into the names of compounds, of which that radical forms a part; M. Chaptal was induced to reject this term from his nomenclature, and to ſubſtitute for it that of *nitrogene*. To this, however, I object, firſt, that it is of Greek extraction; and ſecondly, that it is of ſyſtematic confraternity. If any doubt ſubſiſt whether the mephitic principle be an agent in the formation of nitrous acid (and that it is not, Mr. Kier and Dr. Prieſtley pertinaciouſly maintain) any denomination which implies that it is miſrepreſents the ſentiments of him who conceives that the fact may be otherwiſe. The name, in as far as you intend it to have any operation, is a petitio principii, and preſcinds argument. If you pretend that it is not to operate unfavourably to free diſquiſition, why refuſe to give one not obnoxious to ſuch an imputation?

Laſtly, nitrogene is objectionable, like hydrogene, even on the principles of the French chemiſts. Oxigene, they ſay, is that which, wedded to many different ſubſtances, begets on each of them an acid property: Nitrogene is that, on which alone, by being wedded to oxigene, a nitrous property can be begotten. Thus does the name imply an analogy which has no exiſtence in nature.

The ſame objection holds good againſt a name deviſed by M. Berthollet, *alkaligen*. This principle is not converted into an alkali by union with any ſubſtance but one, inflammable air. Neither have we yet reaſon to believe that this is the eſſential principle of every alkali.

## § 10. *CARBONE.*

THAT principle which oxygen converts into fixed air is by the French nomenclators denominated carbone. They conſider it as a peculiar ſubſtance which abounds in charcoal, but which they allege to be of ſo fugacious and ſubtile a nature, as never to have been obtained in a ſeparate ſtate, or diveſted of every adventitious matter. Hence it is rightly claſſed under the head of principles, and, if a new one, may as well be called by the name carbone as by any other.

Some adherents of the old doctrine, however, ſtill refuſe to admit carbone as a new and ſimple principle. Dr. Prieſtley maintains that fixed air is compoſed of phlogiſton and oxygen; and conſequently that carbone, if the term be at all allowed, muſt be conſidered as either ſynonymous with phlogiſton, or expreſſive of the complex idea of phlogiſton, combined with a peculiar portion of oxygen.

And Dr. Auſtin, who appears to admit mephite as a ſimple principle, labours to prove that carbone is a compound, conſiſting of the eſſential principles of mephitic and inflammable airs. (*Phil. Tranſ.* lxxx. 69.)

But until the compound nature of carbone be ſatisfactorily aſcertained, we are warranted in conſidering it, like mephite, as a ſimple principle. Nor can any injury accrue to ſcience from denominating them as ſuch. Whether ſimple or compound, there is no doubt of their exiſtence. As objects of contemplation they are entitled to names. Theſe names intimate no opinion concerning their nature. Future diſcoveries therefore can only affect theſe names by requiring ſome change in their ſcientific claſſification.

The carbonic principle has at times been called, though not with ſufficient preciſion for philoſophic diſcourſe, *coal*, *charcoal*, *pure charcoal*, and *coaly or carbonaceous matter*.

*Coal* properly ſignifies the mineral we ordinarily uſe for fuel; and *charcoal* the ſubſtance which remains after the imperfect combuſtion of wood.

## CHAPTER III.

## NAMES *of* AIRS.

### § 1. *AIR IN GENERAL.*

THE term *air* is applicable to all fluids, which, in the mode of aggregation of their particles, reſemble that which ordinarily miniſters to reſpiration.

There are ſeveral ſorts of airs, each of which is denominated by a ſpecific appellative, combined with the generic one, air. Atmoſpheric air, however, the obſervation of which gave birth to the generic term, is frequently called, by way of eminence, *the air*.

The French reformiſts, treating of this ſubject, ſet out by declaring, that they have not pretended to make any alteration of ſuch terms as are ſanctified by ancient cuſtom; nevertheleſs they refuſe to admit the term *air* to expreſs a general idea, affirming that the ancients employed it merely as a proper name, and in that ſenſe only to which theſe gentlemen confine it; namely, to expreſs that collection of elaſtic fluids which compoſes our atmoſphere. But in this opinion I apprehend that M. Lavoiſier and his coadjutors were miſtaken.

That the word *air* ſhould have been originally appropriated to the air of the atmoſphere, and afterwards extended to denote every ſpecies of ſimilar elaſtic fluid, is perfectly conſiſtent, and agreeable to the general conduct of the human mind in the formation of language. In the diſcovery of knowledge, and the application of ſuitable names to things and attributes, man firſt aſcends from individuals to generals, and then deſcends from generals to ſorts. He firſt obſerves a particular ſubſtance, as the fluid which he breathes: to this he gives the name of air. Next he obſerves ſeveral other ſubſtances which he does not breathe, or cannot breathe with the ſame feelings, but which all agree with the former ſubſtance in the leading qualities of being light, elaſtic, eaſily diviſible, and quickly permeating all cavities. He is in want of proper names for each of theſe general ſubſtances; but he has already formed a general idea which includes them all, by having combined thoſe, and only thoſe leading qualities which he found conſtantly coexiſting in each particular example. Having thus claſſed the ſeveral ſubſtances which he has obſerved under one head, he denotes them by one denomination; and having called the firſt ſubſtance air, he entitles them all air; converting a proper name into a generic term. Laſtly, he attends to the peculiar qualities which diſtinguiſh various ſorts of air, and marks each ſort by an attributive expreſſive of its predominant eſſential difference, combined with the generic name by which all the ſorts are expreſſed; as rarefied air, condenſed air, cold air, hot air, vitiated air, morbid air, mephitic air, and ſo forth.

Whether this general procedure of the human mind in the formation of language be juſtly exemplified in the particular inſtance adduced, we ſhall now enquire.

What particular leading quality of air gave origin to its name, is not a matter of much import in the preſent enquiry. Some derive it from αημι, or more directly from αω; others deduce it from *αιϱεω*, either on account of its raiſing from the earth vapours and ſmoke, and affording a ſupport to the winged race, or perhaps, according to the opinion of Anaximenes and ſome other ancient philoſophers, from its having been held to be the primary ſupport of all things.

Theſe ſpeculations, however, are not of much moment in the preſent enquiry; becauſe we may grant that the Greeks appropriated the word *air*, in the firſt inſtance, to an individual ſubſtance; yet contend that they afterwards extended its ſignification, and applied it to denote a genus. Such extenſions were very frequently made, and often when they were, the ſubſtance or ſpecies which firſt gave occaſion to the name, the ſenſe of which was extended, retained this name, by way of eminence, without the addition of any peculiar or ſpecific denomination.

The ancients were undoubtedly ignorant of the chemical compoſition of the atmoſphere, (the diſcovery of which conſtitutes ſo brilliant a gem amongſt the philoſophical ornaments of the preſent age) but the idea they ſignified by the word *air* was not that of an identical, homogeneous, unalterable, elaſtic fluid, ſurrounding the earth. A view of the beautiful theory of Hippocrates on this ſubject will afford ſatisfactory evidence of this poſition.

This diſtinguiſhed philoſopher held that there is one common principle which conſtitutes the eſſential ſupport of reſpiration and combuſtion; that this principle is capable of becoming fixed in bodies, ſo as to put off that form which it exhibits in a ſeparate ſtate; that when fixed it is called phyſis, when ſeparate air; Πνευματα δε τα μεν εν τοισι σωμασι φυσαι καλεονται, τα δε εξω των σωματων αηρ.

This uncombined pneuma he denominated air, not excluſively, and by appropriation of the term to one individual ſubſtance alone; but according to the cuſtom of the Greeks, κατ’εξοχην. This appears, firſt, from his uſe of this word in the plural number; for (as Beattie rightly obſerves) "whenever ſubſtances aſſume a plural, "they ceaſe to be proper names, and ſignify a "claſs, or ſpecies of things;" and ſecondly, from his combining with this word, employed in the ſingular number, various adjectives expreſſive of ſpecific attributes calculated to mark the varieties of theſe ſpecies: thus in a treatiſe Περι των αερων, ὑδατων, ϗ τοπων, he treats of different kinds of air, as ακαθαρτος ϗ νοσωδης, αθροωτερος, ϗ μεμιησμενος νοσεροισι μιασμασιν, &c.

Hence it is evident that Hippocrates (to whom we may well reſort for the opinions of the ancients on this ſubject) uſed the word *air* as a generic term, exactly in the ſame ſenſe as we do when we ſay vital air, nitrous air, &c.

Other Greek writers have alſo taken notice of different ſorts of air. We read in Theophraſtus, αηρ υγροτερος; in Athenæus, αηρ μαλακος; and in ſome of inferior note, αερων φθοραι, αερων ευκρασιαι. Plutarch alſo, in his Solon, and in his Precepts for preſerving Health, uſes the plural, airs.

The Romans, who drew much of their ſcientific language from the Grecian ſpring, employed the ſingular and plural of this word in like manner as the Greeks. Thus the philoſophic poet of the Auguſtan age, ſpeaking of the regions in which the heavenly bodies move, ſays,

——"Lunam, ſtellaſque putandum 'ſt,
"Quæ volvunt magnos in magnis orbibus annos,
"Aeribus poſſe alternis a partibus ire."

And Vitruvius, who alſo flouriſhed at the ſame æra, lays down this rule in his treatiſe on architecture, "noviſſe oportet aëres locorum, qui "ſunt ſalubres, aut peſtilentes."

The varieties of air which the ancient Romans diſtinctly ſpecified ſerve ſtill more fully to ſhew, that they included in that term a great many more ſimple ideas than thoſe are willing to allow, who ſuppoſe it to have ſignified merely the circumambient atmoſphere.

In fact, this latter idea was more generally expreſſed by another term, eſpecially when philoſophic preciſion was regarded, as in the language of Cicero, "Omne cœlum hoc, in quo "nubes, imbres, ventique coguntur;" and in that of Ovid, "Ante mare, & tellus, & quod "tegit omnia, cœlum." The regions beyond this were diſtinguiſhed by another name, *æther*.

Mention is made of moiſt air by Ovid and Lucan, "aër humidus," and by Pliny, "roſcidus aër;" of air impregnated with odorous particles by Ovid, "odorare aëra fumis;" of air corrupted by contaminations pernicious to animal life by Virgil, "vitio aëris;" and of the ſame corruptions deſtroying vegetable life by Servius, "vitio moriens aëris herba;" of peſtilent air by Lucan, "tabificum aëra reſolvere;" and again,

> "Hinc hominum, pecudumque lues, hinc peſtifer aër
> "Sævit, & excluſis regnant aquilonibus auſtri."

Laſtly, various kinds of air, with reſpect to fitneſs for reſpiration, and being ſalutary or pernicious to human life, are enumerated by Lucretius. He treats of theſe varieties not ambiguouſly or lightly; but attributes to their influence, in a conſiderable degree, the varieties of form and figure, which characterize the human ſpecies in different parts of the earth, and the varieties of the predominant diſeaſes with which the inhabitants of different countries are affected.

> ——"Primum multarum ſemina rerum
> "Eſſe, ſupra docui, quæ ſint vitalia nobis;
> "Et contra, quæ ſint morbo, mortique neceſſe 'ſt
> "Multa volare: ea cum caſu ſunt forte coorta,
> "Et perturbarunt cœlum, fit morbidus aër.

* * * * * *

"Nonne vides etiam cœli novitate, & aquarum
"Tentari, procul a patria quicunque, domoque
"Adveniunt? Ideo quia longe diſcrepat aër."

In the Engliſh language the word air has always had the ſame acceptation as its prototypes in the Greek and Latin. Thus Mr. Boyle terms the elaſtic fluid extricated by fermentation, which he knew to be noxious to animals and incapable of ſupporting flame, *factitious air*, and ſometimes *artificial air*.

Sir Iſaac Newton, whoſe authority ſhould be alone ſufficient to decide a queſtion of this kind, ſpeaks luminouſly to our purpoſe: "Denſe "bodies by fermentation rarify into different "ſorts of air."

Finally, Dr. Prieſtley, in his earlieſt pneumatic diſcoveries, employed the word air in the ſenſe in which we have repreſented it; and ſince that time the word has obtained as univerſal currency, in the ſame ſenſe, amongſt philoſophers in general, as any ever ſanctioned by the "jus "& norma loquendi."

The only ſynonym to the generic term air is *gas*, a word introduced under the auſpices of

Van Helmont. This word, according to ſome, is of Dutch extraction, being derived from *ghoaſt*, which is ſaid to ſignify ſpirit, or which probably may imply the ſame as our ghoſt, a ſpirit. According to others, it is derived from the German *gaſcht*, which means a frothy ebullition. The former derivation ſeems to import that each particular gas is the eſſence of the body from which it was derived; the latter ſeems to refer the origin of all gaſes to the proceſſes of chemiſtry.

Van Helmont himſelf has not, in general, favoured poſterity with the means of judging very accurately of the nature of his conceptions, by the etymology of his new-coined words. But we may venture to affirm that his ideas are miſinterpreted, by thoſe who apprehend that he meant by the term gas "any elaſtic fluid re-"ſembling in the mode of aggregation of its "particles the fluid which we breathe *." This viſionary chemiſt informs us, in his *Ortus Medicinæ, id eſt Initia Phyſicæ inaudita*, that in order to explain the phænomena of meteorology, he has invented two new names, *gas* and *blas*, by means of which the whole buſineſs is eaſily effected; "adeoque gas & blas totam rem-"publicam meteori in colonias diviſere." (*Gas Aquæ*, *n.* 22.) Of the latter name, ſince it has had the ill luck of being entirely overlooked, we need ſay nothing; but to that which has been taken up by ſo many partizans let us inquire what idea Van Helmont himſelf annexed. He recounts the Moſaical hiſtory of the formation of the world, and inſiſts particularly on this circumſtance, that God created the waters before the air, and that he placed the firmament in the Heaven, to divide the waters above from the waters beneath the earth: He affirms however, that theſe waters have a mutual communication in the atmoſphere, both being converted into vapour, the one by means of caloric particles, the other by means of frigorific particles. On theſe principles he proceeds: "Verum quia aqua in vaporem per frigus delata, "alterius ſortis quam vapor per calorem ſuſci-"tatus; ideo, paradoxi licentiâ, in nominis "egeſtate, halitum illum *gas* vocavi, non longe "a *chao* veterum ſecretum. Sat mihi interim

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* Lavoiſier.

“ ſciri quod gas vapore, fuligine, & ſtillatis “ oleoſitatibus longe ſit ſubtilius, quanquam “ multoties aëre adhuc denſius; materialiter “ vero ipſum gas aquam eſſe, fermento concre- “ torum larvatam adhuc.” (*Progymnaſma Meteori, p.* 28, 29, 30.)

This language is worthy of the man who uſed to boaſt of having made more progreſs in the ſciences while aſleep, by the aid of dreams and nocturnal apparitions, than he had done awake by the uſe of his reaſon *.

If any further elucidation ſeem wanting to evince that this matter, ſo much more denſe than air, and materially water, is not the modern gas, we may add the following poſition of the Flemiſh chemiſt, which is diametrically repugnant to the ideas of his French partizans: “ Impoſſibile eſſe tranſmutationem gas in “ aërem.” (*Gas Aquæ, n.* 44.)

Thus, in whatever point of view we conſider this *offspring of Chaos*, we find it ill qualified to ſuperſede the term air; the claim of which to the excluſive poſſeſſion of the generic idea of an elaſtic fluid reſembling the atmoſphere, the genius of language authoriſes us to vindicate.

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* See ludicrous illuſtrations of this extravagant perſuaſion in his Confeſſio Authoris.

It is ſcarcely worth while to obſerve, that ſome of the modern reformiſts have changed Van Helmont's word into *gaz*,

> "As though their humour
> "Was nothing but mutation, aye and that
> "From one bad thing to worſe."

Certain ſpecies of air not permanently elaſtic in the ordinary temperature of the atmoſphere are commonly called VAPOURS.

Some authors have ſpoken as if there were an eſſential difference between air and vapour; but there is no foundation for this mode of ſpeech, either in philoſophy or uſage. We have reaſon to believe that there is a degree of cold at which every aëriform ſubſtance would be reduced to a ſolid form; and a degree of heat at which every ſolid would be rendered aëriform. Whenever, therefore, we ſpeak of a permanently elaſtic fluid, we refer to a degree of temperature which is arbitrarily fixed. Cicero explains this perfectly well: "Aqua-

"rum enim vapor quidem aër habendus eſt. "Is autem exiſtit motu ejus caloris qui aquis "continetur, quarum ſimilitudinem cernere "poſſumus in his aquis qui effervefcunt ſub- "ditis ignibus." (*De Nat. D.* ii. 40.)

### § 2. *OXYGEN AIR.*

INTERPRETING this name, air of acid origin, or educible from acids, I conceive it to be ſufficiently diſtinctive of the ſubſtance it denotes. And as the term oxygen has acquired conſiderable and merited celebrity from the important diſcoveries which it aſſiſted in uſhering into the world, and is at the ſame time free from the objections which may be urged againſt the other epithets employed to diſtinguiſh this ſubſtance, I think it deſerves a preference above its competitors.

This air was diſcovered in Sweden by M. Scheele; and, much about the ſame time, in England by Dr. Prieſtley. Theſe philoſophers denominated it by different names correſpondent to their reſpective theories. By the former it was termed *empyreal air*, or *air of fire*, from a ſuppoſition that the baſis of this air united to phlogiſton conſtitutes fire. This ſuppoſition, however ingenious, was perhaps ſolely entertained by its author, and hence the name empyreal air, though neither deſtitute of grace nor convenience, never gained ground.

The epithet *dephlogiſticated*, by which this ſpecies of air has been moſt frequently diſtinguiſhed, was intended by Dr. Prieſtley to imply two poſitions, firſt, that this air is deſtitute of phlogiſton; ſecondly, that all other ſorts of air poſſeſs more or leſs of that principle. But while the exiſtence of ſuch a principle as Dr. Prieſtley's phlogiſton is with ſuch appearance of reaſon called in queſtion, can any name be more exceptionable than one which circumſtantially delineates the boundaries of its ſuppoſed empire?

In the place of theſe hypothetic titles, the name *vital air* was ſubſtituted by M. Turgot, and this name alſo has been much in uſe. It is ſhort, ſimple, congenial to our language, and intimates the moſt important and intereſting quality of the ſubſtance it denotes. On theſe accounts it appears in ſome meaſure entitled to the good reception it has met with among philoſophers.

loſophers. But it cannot be concealed that as a chemical term it is by no means unexceptionable. It is incapable of being employed, without groſs catachreſis, in the fabrication of names for chemical compounds, of which this air, or its baſe, forms a part (as vitalized muriatic acid.) This circumſtance alone ſhould have formed a bar againſt its introduction into chemical language, becauſe a neceſſity muſt ſtill have remained for the introduction of ſome ſynonymous term, not chargeable with ſuch a defect.

The name *reſpirable air* is founded upon the ſame contemplations as vital air, but is more exceptionable as it is more vague. Atmoſpheric air is eminently reſpirable; although but one third of it is ſtrictly vital, or chemically contributes to the ſuſtentation of life.

The epithet *pure*, ſelected by Bergman to characterize this ſubſtance, wants the prime requiſite of an epithet, that of being diſtinctive. Every ſubſtance is properly termed pure that is unadulterated. On this head Mr. Kirwan remarks, that "this air, it is true, is not purer "than any other air equally free from heteroge-

“ neous mixture, if by purity freedom from “ mixture be underſtood; but if by purity free- “ dom from contamination, by principles inimi- “ cal to animal life be underſtood, then it is “ entitled to this denomination.” In either point of view, however, this name is incapable of being employed in combination without ambiguity or catachreſis.

### § 3. *MEPHITIC AIR.*

THIS is the air which conſtitutes two thirds of the atmoſphere, and is or contains the mephitic principle. It received this name from one of its earlieſt diſcoverers, Dr. Rutherford *.

By Dr. Prieſtley, who alſo has the credit of having diſcovered it, the title of *phlogiſticated* was aſſigned to it, from an erroneous conception that it was atmoſpheric air ſurcharged with phlogiſton.

It was called *foul air* by M. Scheele: but foul implies contamination, which is irreconcileable with the idea of an unmixed ſubſtance.

M. Guyton at firſt acknowledged this air by the title of mephitic; but this term, it would ſeem, did not appear ſufficiently novel to the confederate reformiſts; for although it had borne ſway on the continent for ſome time, it was held meet, at the grand revolutionary council of nomenclature in Paris, that it ſhould be formally depoſed, and *azotic gas* erected in its ſtead. Philology revolts againſt this monſtrous combination of heterogeneous ſounds, dragged from ancient Greece, and the modern United Provinces, and tied together in deſpite of taſte and judgment. Of the impropriety of the name azote or any of its modifications I have already ſpoken. Azotic gas, ſtrictly interpreted, ſignifies *a lifeleſs emanation of chaos.*

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* This is ſtated upon the authority of Dr. Pearſon, ſee his *Tranſl. of the Fr. Chym. Nomencl. p.* 26.

From the objections which I have urged againſt M. Chaptal's nitrogene, it is obvious what may be alleged againſt his *nitrogenous gas.* At the ſame time it muſt be confeſſed that with reſpect to the completion of ſyſtematic, analogical nomenclature, his alteration poſſeſſed one peculiar merit. The radical and its ramifications ſhould certainly have been homogeneal, not azote and azotic, or mephite and mephitic converted into nitrous. Without inſiſting that this ought to be, it is eaſy to ſhew how it might be effected, by leſs exceptionable alterations than thoſe of M. Chaptal.

The radical principle might be denominated NITRONE, conformably with carbone.

This principle rendered aëriform, might be denominated NITRIAN AIR.

We ſhould then have the following ſucceſſion of names, the firſt indicating the uncombined principle, the reſt, in order, the ſame principle combined with oxygen in different proportions progreſſively increaſing, and each intimating the peculiar ſtate of aggregation of the ſubſtance it was intended to denote: nitrone, nitrian air, epinitrous air, nitrous air, nitrous vapour, nitrous acid, nitric air, nitric acid.

The name nitrian air merely implies that this air is of or belonging to that ſubſtance from which the epithet is derived; an educt or product of nitre, as Parian marble is an educt from Paros, or as Tyrian purple was a product of Tyre.

That in this extended ſenſe the appellation is correct, the obſervations and opinions of chemiſts of every ſect concur in teſtifying.

It is well known that this air may be extracted from nitre ſimply by heat.

It is alſo known that the electric ſpark taken in atmoſpheric air, which is a mixture of this and oxygen air, produces nitrous acid, one of the conſtituent parts of nitre.

It appears, therefore, both by analytic and ſynthetic examination, that this air, or its radical principle, is contained in nitre.

That it is an eſſential conſtituent part of nitrous acid is moreover the opinion of philoſophers of very different theoretical ſects.

Thoſe of the antiphlogiſtic ſchool hold that this air is the acidifiable baſe, which, united to the acidifying principle, conſtitutes nitrous acid. With them, therefore, this name is perfectly ſyſtematic.

Some of the phlogiſtians held this air to be an eſſential part of the acidifiable baſe of nitrous acid; for this acidifiable baſe they conceived to be compoſed of a ſmall portion of inflammable air united to nitrous baſe, which nitrous baſe conſiſted of oxygen air, united with this, which might therefore be termed nitrian air.

The opinion of ſir Torbern Bergman and Mr. Cavendiſh, though very different from either of the former, is equally congruous with this name. Theſe philoſophers conſider the air in queſtion as a compound of phlogiſton and nitrous acid. It is therefore as well entitled to the denomination nitrian, as to that of phlogiſticated. But if the proportion of phlogiſton contained in inflammable air be greater than that contained in phlogiſticated air, as the generality of phlogiſtians allow, the latter is ſurely improperly characterized by an attribute which it poſſeſſes in an inferior degree to the former. It only remains, then, that it ſhould be denominated from its other conſtituent part, a title to which no other ſpecies of elaſtic fluid can lay a ſuperior claim.

I have heard it objected that oxygen air might lay claim to the appellation nitrian, with as good right as the air in queſtion, ſince both are contained in nitre. The fact is true, but the objection is not valid; for oxygen air, or its baſe, exiſts as a conſtituent part of ſalts compoſed with any acid; nitrian air, or its baſe, exiſts in thoſe only of which the nitrous acid is compoſed. The former then is common to all ſalts, the latter peculiar to nitrous.

Thus whether we examine facts ſimply, or through the medium of any theory, the name nitrian air appears philoſophically correct. In point of philological propriety it meets the judgment of Scaliger, "magis refert ut brevis, "& rectus & ſimplex ſit, quam longus, & "varius," it is ſhort, eaſy of pronunciation, conſonant to the genius of the Engliſh language, and derived without force from the Latin, into which it is readily convertible.

### § 4. *EPINITROUS AIR.*

THIS is a compound ſubſtance formed of mephitic or nitrian air, chemically united with a ſmall portion of oxygen. According to the obſervations of Meſſrs. Van Trooſtwyk and Deiman (*Recherches Phyſico-Chymique*, 1793) it contains but 37 parts in 100 of oxygen, while nitrous air contains 68 parts in 100 of the ſame principle. In other reſpects theſe airs appear to be ſo exactly ſimilar in their compoſition, that I have ventured to affix to this ſubſtance a new name, expreſſive of its relation to nitrous air. The neceſſity for this innovation will appear from an examination of the names by which it has been hitherto diſtinguiſhed.

Dr. Prieſtley, having expoſed iron to nitrous air, found the iron converted into ruſt, and the nitrous air into the ſubſtance of which we are now treating. At firſt ſuppoſing that the calces of metals contain leſs phlogiſton than the metals themſelves, he concluded that ſome phlogiſton had paſſed into the nitrous air, and therefore denominated the air reſulting from the proceſs *phlogiſticated nitrous air.* Afterwards however, having changed his opinion of the nature of ruſt, and ſuppoſing it to contain more phlogiſton than iron does, he inferred that a contrary proceſs from that which he at firſt imagined, had really taken place; that the nitrous air had parted with its phlogiſton to the iron, and of courſe that, thus altered, it ought to be termed *dephlogiſticated nitrous air.* As it is univerſally held that with regard to the nature of compound ſubſtances, the ſubtraction of phlogiſton is tantamount to the addition of oxygen, and converſely, it muſt be acknowledged by chemiſts of every ſect, at the preſent day, that Dr. Prieſtley's latter views of the changes wrought on iron by its converſion into ruſt were erroneous. The rejection of his favourite name, therefore, as conveying opinions acknowledgedly falſe, and of his original name as conveying opinions hypothetical and probably falſe, requires no farther apology.

The next name which this air received was *deacidified nitrous air*; a name, however, which I conſider as only defenſible upon principles oppoſite to thoſe whereon it reſts, in the Eſſay on Phlogiſton and the Conſtitution of Acids. In that ingenious and ingenuous ſpecimen of polemic chemiſtry, this air is defined to be "nitrous baſe free from the acidifying principle "and adventitious phlogiſton." But in the firſt place, this definition is at variance with the name, for nitrous air itſelf is not held to be acidified. Nitrous air is ſaid to be compoſed merely of nitrous baſe and inflammable air, without any mixture of fixed air, which is ſuppoſed to be the acidifying principle. In the next place, the definition is founded on an erroneous conception of the nature of this ſubſtance. Nitrous baſe is ſaid to be compoſed of oxygen and mephitic airs. Mephitic air is further compoſed of oxygen and inflammable airs. And this laſt is phlogiſton. Now this portion of phlogiſton being *eſſential* to the conſtitution of nitrous baſe, cannot be that which is deſigned in the definition as *adventitious*. When therefore it is ſaid that "deacidified nitrous air is "nitrous baſe, free from adventitious phlogiſ-"ton," this muſt be underſtood with reference to nitrous air, which is ſaid to be compoſed of this ſame nitrous baſe and inflammable air or phlogiſton; and we are to conceive that deacidified nitrous air contains leſs phlogiſton, united to a given quantity of oxygen air, than nitrous air does. But as oxygen air is now allowed to be or to contain the acidifying principle, it muſt follow that this air, in compariſon of nitrous air, is *ſuperacidified*. This concluſion however is contrary both to the name and to the fact. In fine, notwithſtanding an approximation to correctneſs which has accrued to this name from the revolutions of theory, I think it ſtill objectionable, as having been introduced under different auſpices from thoſe by which it is now defenſible, and as indicating a total privation inſtead of a diminution of the acidifying principle contained in nitrous air.

The next name conferred on this ſubſtance was that of M. de la Metherie, in his "Eſſai "Analitique ſur l'Air pur, & les differentes Eſ-"pèces d'Air." Having found, he ſays, that one meaſure of this air, mixed with one of atmoſpheric air, occupied the ſpace of 1.31, and that one meaſure of the ſame air, mixed with one of nitrous air, occupied the ſpace of 1.45, ſo that this air acts upon oxygen air as nitrous air does, and upon nitrous air as oxygen air does, he concluded that it is a compound conſiſting of the eſſential principles of both, and denominated it *nitrous air with exceſs of pure air*. But M. de la Metherie has been ſome how or other egregiouſly deceived in his experiments. Dr. Prieſtley (ii. 82.) tells us that "he mixed "this air with all the other kinds of air that he "had made, but it did not unite with any of "them, and no ſenſible change was made in it "by any of them, or in any of them by it:" and Meſſieurs Van Trooſtwyk and Deiman alſo teſtify that this air when pure is neither decompoſed nor diminiſhed in bulk on being added to atmoſpheric, oxygen, or nitrous air. That it is nitrous air not combined with exceſs of oxygen, but deprived of part of its oxygen, is evident from its being procured by expoſing nitrous air to the action of ſuch ſubſtances as oxygen air is known to have a greater affinity to than it has to mephitic air, ſuch as iron filings, ſulfuriſed vegetable alkali, muriated tin, &c. Nitrous air, combined with an additional portion of oxygen air, is inſtantly converted into nitrous acid.

A ſimilar impropriety diſtinguiſhes the ſyſtematic name of the French reformiſts, *oxygenated nitrous gas*.

The authors of the memoir on this ſubject in the Recherches Phyſico-Chymiques have corrected the error of their predeceſſors with regard to the nature of this air, and entitled it *gazeous oxyd of azote*. But in addition to the general objections which I have urged againſt the French ſyſtem of nomenclature, I think this name objectionable on their own principles. The words *gazeous oxyd* ſeem to indicate an aëriform metallic calx.

The abbè Fontana having procured this air by means of nitro-muriatic acid or aqua regia, denominated it *regal air*. This fanciful name however originated in a miſtake, for the muriatic acid is not neceſſary to its production, as he imagined.

### § 5. *NITROUS AIR.*

THIS is a compound ſubſtance, formed of mephitic or nitrian air chemically combined with a portion of oxygen greater than that contained in epinitrous air, and leſs than that contained in nitrous vapour. Its name has enjoyed the ſingular felicity of remaining unimpeached amidſt all the revolutions of theory. Let it continue to enjoy this immunity; for a ſtable nomenclature not exactly correct, is preferable to one perpetually varying with the diſcovery of new analogies.

### § 6. *SULFURISED MEPHITIC AIR.*

THIS is mephitic air holding ſulfur in ſolution. It has been procured by M. Haſſenfratz, by paſſing mephitic air over ſulfuriſed vegetable alkali in fuſion; and he has ſeparated the ſulfur from it by water.

### § 7. *SULFURISED NITROUS AIR.*

THIS is nitrous air holding ſulfur in ſolution. It has been procured by M. Haſſenfratz, in the ſame manner as the foregoing, only uſing nitrous air inſtead of mephitic; and the ſulfur has been ſeparated from it by oxygen air.

### § 8. *PHOSPHORISED MEPHITIC AIR.*

THIS is mephitic air holding phoſphorus in ſolution. The experiments of M. Guyton on the combuſtion of phoſphorus remove all traces of doubt with regard to the poſſibility of the formation of this ſubſtance. (*See Encyclopédie Methodique*, i. 707. 9.)

According to the French nomenclature it is ſtyled *phoſphoreous azotic gas.*

### § 9. *INFLAMMABLE AIR.*

This name ought, in my opinion, to retain its ſtation; not that it is unexceptionable, but becauſe the inconvenience which ſcience would ſuffer from the abolition of ſo well-eſtabliſhed a name a name could hardly be overbalanced by the advantage accruing from the introduction of one ſomewhat more appoſite.

The epithet inflammable is certainly very characteriſtic. However it muſt be allowed, that names given to the more ſimple ſubſtances from their properties, are, generally ſpeaking, leſs uſeful, than thoſe which reſpect their origin; becauſe the former may oftentimes be applied with equal propriety to ſubſtances of different ſorts. Thus it cannot be denied that elaſtic fluids of very different natures manifeſt inflammability; although it be indubitable that ſeveral of them poſſeſs this property by virtue of their admixture with a certain portion of the air of which we are now treating. Certain inflammable ſubſtances, as ſulfur, phoſphorus, carbone, are capable of ſolution in inflammable air, and modify, though they do not confer inflammability on this air. So far, then, all is right: but when we further learn that other inflammable ſubſtances, as æthers, and eſſential oils, are ſoluble in other ſpecies of air, and that by their ſolution they render thoſe airs inflammable, we perceive that the term inflammable is generic, and not correctly diſtinctive of any particular ſpecies of inflammable air.

This ſubſtance muſt therefore now be conſidered as entitled only κατ' ἐξοχην to the name inflammable air.

Having already ſpoken of the Gallo-Grecian hydrogene, and the Anglo-Grecian hydrophloge, I need make no comment on their offspring *hydrogenous gas*, and *hydrophlogic gas*.

## § 10. *HEPATIC AIR.*

THIS air is allowed on all hands to contain ſulfur, and to be inflammable; it might therefore perhaps without impropriety be called *ſulfuriſed inflammable air*. Certainly no name could be more proper, if the ſubſtance it denotes were really proved to be ſulfur diſſolved in inflammable air. But philoſophers of conſiderable eminence, Mr. Kirwan and Dr. Crawford, deem it to be merely ſulfur in an aërial form. Though I perceive ſome objections to Dr. Crawford's calculations, upon which his opinion ſeems principally grounded, and though I think the experiment he adduces rather concludes againſt his opinion, as he acknowledges "that probably ſome degree of moiſture is "neceſſary to the ſucceſs of that experiment," from the decompoſition of which it is probable that inflammable air was produced, (*See Phil. Tranſ.* lxxx. 416.) yet deference to ſuch high authorities ſhould preclude us from uſing a name founded on a theory to which they do not aſſent. It appears better therefore to adhere to the name conferred on this ſubſtance by Bergman, the name indeed by which it has been moſt generally known. He denominated it hepatic air from its being ordinarily procured from hepar ſulfuris; although it is ſo far from being neceſſarily hepatic in its origin, that M. Scheele recommends diſſolving ſulfuriſed iron in ſome of the mineral acids as the beſt method of procuring this air pure for experiments.

Dr. Webſter ſeems to have been miſled by the term hepatic into a ſtrange error concerning the nature of this air; for in a ſcheme for the adumbration of the nature of ſubſtances by their names, he propoſes that this ſhould be called *ſulfurcaline air*. (*Med. Com.* xii. 473.)

M. Scheele when he diſcovered this air called it *ſtinking ſulfureous air*. But we muſt own that common ſulfureous air has no very ſweet ſavour.

### § 11. *PHOSPHOREAL AIR.*

By this name I deſire to expreſs the air which M. Gengembre procured by digeſting phoſphorus with cauſtic alkali. I have here taken a liberty in which I very ſparingly indulge, that of introducing a new name. My beſt apology is to ſhew, by an examination of the other names conferred on this ſubſtance, that the occaſion required it.

M. Gengembre entitled it *phoſphoric air*; but to this name the phoſphoric acid in an aëriform ſtate alleges a juſt claim from analogy with other aëriform acids.

M. de la Metherie, from a perſuaſion that it is inflammable air holding phoſphorus in ſolution, gave it the name of *phoſphoric inflammable air*. But as this opinion is controverted, and the air we ſpeak of held by reſpectable authority to be merely aëriform phoſphorus, it ſeems neceſſary to aſſign it a deſignation expreſſive of the family to which it belongs, but indeciſive

of

of the queſtion concerning its ſimplicity or compoſition.

### § 12. *MARSH AIR.*

The air incumbent over marſhes, which Dr. Franklin diſcovered to burn with a lambent flame upon the application of fire, was by him denominated *marſh inflammable air*. This air is ſufficiently identified by ſpecifying its ordinary habitation, without introducing into its name any of its properties.

From a compariſon of its gravity with that of pure inflammable air it has generally been called *heavy inflammable air*. But the epithet heavy, being applicable to every aëriform compound conſiſting of a ſubſtance diſſolved in or mixed with inflammable air, is not characteriſtic of the particular ſpecies which is procured from marſhes, or in general from the deſtruction of vegetables; and being a relative term requires the correlative light to be prefixed to pure inflammable air, and perhaps other correlatives to the names of mixtures ſimilar to marſh air, expreſſive of different degrees of ponderoſity, according to their different ſpecific gravities.

Some of the French chemiſts, conceiving this ſubſtance to be inflammable air holding carbone in ſolution, call it *carbonaceous hydrogenous gas*. Others, eſteeming it, with Dr. Auſtin, a mixture of inflammable and mephitic airs, term it *azotic hydrogenous gas*. The advantage of a name which ſteers clear of controverſy muſt be admitted, and peculiarly ſo if, according to M. Carradori's Analyſis (*Brugnatelli Annali di Chim.* i.) both parties be inaccurate, if this ſubſtance really conſiſt of inflammable air with a mixture of ſome mephite, carbone, and fixed air.

## § 13. *ANIMAL AIR.*

By this name I underſtand the air extricated from animal ſubſtances by diſtillation, and which Dr. Crawford has proved to conſiſt of inflammable air holding ſome animal matter in ſolution. (*See Expts. and Obſ. on the Matter of Canter, Phil. Tranſ.* lxxx. 404.)

Becauſe this air reſembles ſomewhat in its odour hepatic air, Dr. Crawford entitled it *animal hepatic air*. But ſince hepar ſulfuris cannot have any ſhare in its formation, and ſince it is decidedly free from any admixture of ſulfur or hepatic air, (which Dr. Crawford himſelf proves) the term hepatic ought to be avoided, not only as being ſuperfluous, but as tending to convey an erroneous notion of its conſtitution; I have accordingly ventured to expunge it.

### § 14. *HEPATIC VAPOUR.*

THERE is a ſpecies of hepatic air firſt diſcovered by Mr. Kirwan, "which exiſts in an "intermediate ſtate between the aëriform and "vaporous; this fluid not being permanently "elaſtic like air, nor immediately condenſed "by cold like vapour, but gradually aſſuming "the non-elaſtic form; in conſequence, pro"bably, of the tendency of its ſeveral parts "to unite with each other."

### § 15. *ANIMAL VAPOUR.*

A PORTION of the air extricated from animal ſubſtances by fire has been diſcovered by Dr.

Crawford to poſſeſs ſimilar properties. (*Phil. Tranſ.* lxxx. 406.) Theſe, if there were occaſion, might be diſtinguiſhed from the more permanently aëriform ſpecies, which they reſpectively reſemble, by the names HEPATIC VAPOUR, and ANIMAL VAPOUR.

### § 16. *OLEAGINOUS AND BITUMINOUS AIRS.*

COMBINATIONS of other ſubſtances with inflammable air beſide thoſe enumerated may require peculiar names when they become more the objects of contemplation, and when their nature ſhall be better aſcertained. For example, different kinds of oil (*See Prieſtley*, iii. 536.) and probably bitumen may be diſſolved in inflammable air.

### § 17. *ATMOSPHERIC AIR.*

OTHER ſpecies of airs are produced by various mixtures of thoſe already enumerated, as well with each other, as with the acid airs, and with the alkaline air hereafter to be mentioned. Whether theſe are true chymical compounds, as ſome affirm, or mere mechanical mixtures, as others contend, appears to be a matter of no conſequence as far as concerns nomenclature. They may be all denominated, by an enumeration of their component parts; except one ſpecies, which from the univerſality of its extent, and the general uniformity of proportion in which the ingredients that compoſe it are mixed, is remarkably an object of contemplation, and as ſuch has received the denomination κατ' εξοχην of THE AIR, as well as the diſtinctive appellation of ATMOSPHERIC AIR. The mean ſtandard of this air is one part oxygen air, and two parts mephitic air. A ſmall increaſe of the proportion of the former renders it what we call pure or good air, and of the latter foul or bad air.

### § 18. *VAPOURS IN GENERAL.*

BESIDE the aëriform fluids which are permanently elaſtic in the ordinary temperature of the atmoſphere, there are ſeveral which preſerve their elaſticity only in a ſuperior temperature. Theſe are called the VAPOURS of water, alcohol, oils, acids, neutral ſalts alkaline and metallic, metals, and metallic calces.

CHAP.

## CHAPTER IV.

## NAMES *of* ACIDS.

### § 1. *DENOMINATION OF ACIDS IN GENERAL.*

BERGMAN (*Opuſc.* iv. 263.) propoſed that the word acid ſhould be employed ſolely in denominating the genus of ſalts which that word ſignifies; that in denominating the ſpecies, the ſeveral adjectives ordinarily combined with the generic term ſhould be converted into ſubſtantives, or underſtood as ſuch; that vitriolic, nitrous, muriatic, regaline, fluorate ſhould be the appropriate names of the different acids now diſtinguiſhed by theſe ſpecific appellations. It muſt be acknowledged that this plan is calculated to abridge, and in ſome meaſure to ſimplify the language of chemiſtry: but I can ſcarcely think that the inconvenience of the preſent mode of ſpeech is ſuch as to warrant the adoption of one ſo affectedly technical.

The names of acids have been expreſſed after a two-fold manner; by a ſpecific ſubſtantive depending on the generic one, acid, as acid of vitriol, acid of ſalt, acid of nitre, &c.; and by a ſpecific adjective conjoined with the generic ſubſtantive, as vitriolic acid, muriatic acid, nitric acid, &c. In ſome caſes it is of no conſequence which of theſe two modes is preferred, except in ſo far as a general uniformity of denomination of ſubſtances of the ſame kind ſeems eligible. With this view the ſpecific adjective ſhould be univerſally preferred. For, in the firſt place, different modes of termination of adjectives ſpringing from the ſame root indicate different proportions in the compoſition of the ſame ingredients, an advantage which cannot appertain to ſpecific depending ſubſtances; thus the acid of nitre may be either nitrous or nitric acid, the acid of phoſphorus phoſphoreous or phoſphoric. Secondly, the poſſeſſive adjective, which indicates the preſence of any particular acid in combination, ought to be obviouſly related to the term that denotes that acid in its ſeparate ſtate; now this relation always ſubſiſts to the ſpecific adjective, but not always to the ſpecific depending ſubſtantive; thus neutral ſalts partly compoſed with the acid of ſalt are muriated, with the acid of amber ſuccinated, with the acid of apples malated, with the acid of ants formicated; whereas the denominative and the poſſeſſive adjectives uniformly ariſe from the ſame origin, muriated ſalts are formed by the muriatic acid, ſuccinated by the ſuccinic, malated by the malic, and formicated by the formiceous.

Of acids compoſed of one baſe and oxygen there may be three diſtinct varieties, and perhaps more, ariſing from the different quantities of oxygen united with the baſe. The ordinary or ſaturating quantity is underſtood to be united with the baſe when the denominating adjective terminates in *ic*. When it terminates in *ous* the acid is underſtood to be deficient of oxygen. Theſe are cuſtomary marks of diſtinction, and ſufficiently conſonant with the genius of our language. But when we deſire to expreſs the combination of an extraordinary or ſuperſaturating portion of oxygen with acids, we muſt ſtill, I apprehend, be at a loſs if we do not reſort to M. Lavoiſier's etymology. The epithet *dephlogiſticated*, which the phlogiſtians prefix to the name of the ſaturated acid for this purpoſe, has been ſufficiently ſcouted. But even that of *oxygenated*, which the antiphlogiſtians employ in the ſame manner, is unwieldy and inconvenient. On theſe accounts Mr. Kirwan has been led to combine the leading member of the term oxygen with the names of the different acids ſuperſaturated with the principle it denotes, forming a compound by ſyncope, as oxyvitriolic acid, oxymuriatic acid. This language is, I grant, convenient and intelligible, and theſe are undoubtedly no trifling recommendations; yet the employment of Greek auxiliaries is objectionable, and their employment in the ſame ſervice with Latin eſpecially ſo. However, it may be alleged with Cicero, "Verba nova parienda eſſe, imponendaque "nova novis rebus nomina, uſuque mollienda "quæ dura præ novitate viderentur;" and it may be ſtated as a peculiarity of the preſent caſe, that the names of the acids not being all deduced from one language, an adjunct applicable to them all muſt ſometimes of neceſſity violate the ordinary rules of philological propriety.

In enumerating the mineral acids I notice only three which have a metallic baſe, although there appears great reaſon to ſuſpect with Scheele, that "all the metallic earths may be "conſidered as ſo many ſpecies of fixed acids." (*Crell's Jour.* iii. 106.) This exquiſite ſcrutinizer into the receſſes of nature declared, that "he had no doubt that the baſis of all acids "is contained in empyreal air." (*Crell's Jour.* iii. 117.) Now as we know that the calcination of all metals is effected by the combuſtion of empyreal air or oxygen with them, it is highly reaſonable to expect that we may find traces of acidity in every metallic calx. We have no doubt of the convertibility of arſenic, molybdæna, and tungſten into peculiar acids; and it is highly probable that, following the ſteps of Bergman with zinc, of Hermbſtadt and Haſſenfratz with tin, of Haſſenfratz with iron, and of Rouelle with antimony, we ſhall be ſatisfied that theſe metals alſo may be converted into peculiar acids. I am at a loſs, I muſt own, to comprehend Mr. Kier, when he ſays (*Dict. p.* 90.) "A great objection to the theory "of metals being radically acids is, that the "moſt perfect metals are not only incapable of "acidification, but alſo of the intermediate ſtate, "calcination." A philoſopher of his erudition could hardly have forgotten that Homberg and Macquer have vitrified gold, that Juncker and Macquer have vitrified ſilver, and that Margraaf has by fire tarniſhed the ſurface and increaſed the weight of platina. The experiments of the academicians of Paris with the burning lens, of Ehrman with oxygen air, of Bergman with the blow-pipe, and of Van Marum and Guyton with electricity, abundantly prove that the three perfect metals (as they are called) may be reduced to coloured calces; that with fluxes they may be vitrified and converted into coloured glaſſes; that platina may be calcined by nitre; and not only calcined but converted into ſmoke by the electric fire. (*See Elhuyar, in Bergbaukunde. Com. Lipſ.* xxxiv. 416.)

Thus can thoſe metals be calcined in the dry way. But who does not know that by ſolution in acids, and precipitation by alkalis or earths, they may be eaſily exhibited in a calciform ſtate, reſembling in their appearance and habits the calces of other metals? We ſee then that all metals are allied in their properties; all may be combined with oxygen, or the acid-educing principle, and by ſucceſsful modes of combination with this principle, all may perhaps be rendered acids.

### § 2. *SULFUREOUS ACID.*

THAT liquid acid which poſſeſſes ſimilar properties to the vitriolic, except that it emits a penetrating odour with fumes, that it whitens colours, and that it forms with certain ſubſtances neutral ſalts, which differ at firſt from thoſe formed with the ſame ſubſtances by vitriolic acid, but become ſimilar by expoſure to the air, has been moſt generally known by the name of ſulfureous acid; a name equally compatible with the opinion of either of the two moſt diſtinguiſhed chemical ſects. This acid, according to one ſect, is vitriolic acid combined with an additional portion of phlogiſton; according to the other, it is vitriolic acid deprived of a portion of oxygen. Widely as theſe theories differ, the ſame fact is implied by both; namely that the ſubſtance in queſtion is ſulfur diſſolved in vitriolic acid, or that it is ſulfureous acid. Aſk a phlogiſtian what ſulfur is? He will ſay, a compound of vitriolic acid and phlogiſton. Then, vitriolic acid combined with an additional portion of phlogiſton muſt be ſulfureous acid. Aſk an oxygeniſt what ſulfur is? He will tell you, that ſimple ſubſtance which when ſaturated with oxygen conſtitutes vitriolic acid. Then, vitriolic acid deprived of a portion of its oxygen is ſulfureous acid. This name, therefore, expreſſes the fact, without contravening either theory.

This ſubſtance has alſo been diſtinguiſhed by the names *volatile vitriolic acid*, and *phlogiſticated vitriolic acid*. Both of theſe names are incapable of being employed in combination. The latter ſeems to imply that phlogiſticated air, or the eſſence of that ſubſtance, is a conſtituent part of this acid; a circumſtance very improbable.

### § 3. *SULFUREOUS AIR.*

THIS is pure ſulfureous acid in an aëriform ſtate.

It has been denominated by Dr. Prieſtley *vitriolic acid air*, and by M. Scheele *vitriolic air*. Theſe names however appear incorrect. This air is not the eſſence of pure vitriolic acid; nor does the compound formed by this air and water poſſeſs the properties of vitriolic acid, as the compound formed by muriatic air and water poſſeſſes the properties of muriatic acid, or that of nitrous vapour and water thoſe of nitrous acid: on the contrary, this air is derived from ſulfureous acid, and the compound of it and water is true ſulfureous acid. If theſe poſitions be eſtabliſhed, the propriety of the name by which it is here denoted will, I preſume, be admitted.

Firſt, this air is not extrahible from vitriolic acid alone; but if to vitriolic acid be added oil, alkohol, charcoal, or metals; (ſubſtances which, according to ſome, are diſpoſed to part with phlogiſton, and which, according to others, are greedy of oxygen) and if the reſpective affinities of aggregation of thoſe ſubſtances be deſtroyed by fire, this air will be produced. Theſe are the very operations whereby part of the vitriolic acid is converted into ſulfur, which latter, as we have already ſeen, is held in ſolution by the unconverted vitriolic acid, ſo that the liquor becomes ſulfureous acid.

Secondly, the vapours of ſulfureous acid, prepared in what manner ſoever, received over mercury, appear, by the proper teſts, to be the ſame air as that which is attained by heat from vitriolic acid and combuſtible ſubſtances.

Thirdly, ſulfureous air ariſes in the ſolution of pure ſulfur in vitriolic acid by the aſſiſtance of heat.

Fourthly, if this air be mixed with atmoſpheric air, and water be admitted, vitriolic acid will be produced; oxygen being abſorbed from the atmoſphere, as will appear by the teſt of the eudiometer with nitrous air applied to the reſidue.

Fifthly, this air forms the ſame neutral ſalt with volatile alkaline air that the ſulfureous acid does with volatile alkali.

## § 4. *VITRIOLIC ACID.*

THIS name has been long received, and univerſally underſtood, not only by chemiſts, but by the people. It does not aim at characterizing the ſubſtance it denotes by diſplaying its eſſence, but it identifies it by ſpecifying the ſource from which it was firſt, and has been moſt generally drawn.

Vitriol is a generic term denoting a ſalt compoſed of vitriolic acid and a metallic calx: hence we have vitriols of iron, of copper, of zinc, of ſilver, &c. The etymology and the origin of the introduction of this term, as well as its ſignification, appear from the following paſſage in the third book of Geor. Agricola de Natura Foſſilium, printed at Baſil, in 1546, wherein the word vitriolum occurs for the firſt time in medical writings. "Atramentum "ſutorium variis coloribus præditum eſt. Can"didum potiſſimum ſtiriæ figura reperitur "Goſelariæ, tranſlucidum cryſtalli inſtar. Nec "cæruleum, nec viride caret perſpicuitate; "unde ſuperior ætas atramento ſutorio VITRIOLI "nomen impoſuit."

Vitriolic acid has been principally extracted from a ſpecies of vitriol, juſt as nitric acid has been chiefly derived from nitre, and muriatic acid from muria. The name therefore appears unexceptionable; it coincides with analogy, and cannot miſlead.

By names of this deſcription theoretic revolutions can never be impeded; and they, in return, ought to enjoy an immunity from being affected by ſuch revolutions.

*Oil of vitriol* is merely a commercial name, whereby merchants denote this acid in the ſtate of concentration in which it ordinarily comes from the hands of the manufacturers. The name evidently implies an analogy which does not exiſt: it is abandoned by philoſophers, and even amongſt traders is ſcarcely preferred to the name vitriolic acid, which is equally well underſtood.

The French reformiſts, however, have propoſed to ſuperſede the name conferred on this ſubſtance by the fathers of chemiſtry, and have denominated it *ſulfuric acid.* But granting their principle, that ſulfur enters wholly into the compoſition of this acid, why ſhould it be called the ſulfuric acid? Does nitre enter wholly into the compoſition of nitrous acid? or muria into that of muriatic acid? As the reformiſts have retained the latter denominations, it is to be preſumed that they deem them proper; their new name muſt, therefore, by analogy, be improper, and ought not to be received.

### § 5. *OXYVITRIOLIC ACID.*

THIS is vitriolic acid combined with an additional portion of oxygen.

Some chemiſts, particularly Meſſrs. Vauquelin and Bouvier, (*Ann. de Chim. tom.* vii.) entertained doubts of the exiſtence of ſuch a ſubſtance. They ſuſpected that M. Crell, (*Mem. ſur le Mangane ſe, Journ. de Phyſ.* 1789.) and after him M. Schurer, (*Syntheſis Oxygenii Exper. confirmata.*) who affirmed that vitriolic acid might be oxygenated in the ſame manner as muriatic acid, had been deceived, either by employing vitriolic acid contaminated by the muriatic, or by ſome other circumſtance which had eſcaped their obſervation. But the obſervations of M. Weſtrumb, Dr. Hermbſtadt, and Prof. Fuchs, (*Crell's Ch. Jour.* iii. 262.) and eſpecially the reſearches of M. Giobert, (*An. de Chim.* xi. 178.) have eſtabliſhed the exiſtence of this ſubſtance beyond controverſy.

At the ſame time it deſerves to be remarked that M. Giobert's liquor, which he exhibits as the vitriolic acid ſurcharged with oxygen, contains alſo a portion of the calx of manganeſe diſſolved in this acid. He alleges, indeed, that a ſimilar ſolution takes place in the liquor obtained by diſtilling the muriatic acid over manganeſe; only that this latter acid may be more highly impregnated with oxygen, while it contains a ſmaller portion of the calx of mangeneſe.

Is not the hyperoxygenation of the vitriolic acid farther illuſtrated by Mr. Kier's liquor (*Ph. Tranſ. for* 1790.) formed of nitre diſſolved in vitriolic acid, which has the property of diſſolving ſilver?

### § 6. *NITROVITRIOLIC ACID.*

THIS is a combination of the nitric and vitriolic acids, ſuch as Mr. Kier ſays might have been termed *aqua reginæ*.

### § 7. *MEPHITISED VITRIOLIC ACID.*

THIS is what Mr. Kier terms *the mixture of vitriolic and nitrous acids phlogiſticated.*

### § 8. *NITROUS ACID.*

BY this name I underſtand, in common with almoſt all chemiſts, that acid drawn from nitre which poſſeſſes ſimilar properties to nitric acid, except that it is more ponderous, more volatile, of a blue, green, orange, or red colour, that it emits copiouſly orange or red fumes, and extricates thoſe before it enters into combination with the ſeveral ſubſtances with which it is capable of combining, ſo as to form compounds of the ſame nature as the nitric acid does with the ſame ſubſtances.

By nitre I mean the ſubſtance which the moderns diſtinguiſh by that name; a ſubſtance, however, materially different from the nitre of the ancients. And therefore I wonder how this name and its derivatives were reſpected by the French, in the midſt of their zeal for the reſtoration of Grecian nomenclature, and their contempt of every thing which aroſe in the middle ages of chemiſtry.

The word nitre is originally Aramæan. Its theme ſignifies to diſſolve, in that language; as has alſo been obſerved of the Greek νιζειν, whence ſome have deduced νιτρον. It was applied to denote a foſſile ſubſtance which was uſed in the waſhing of cloaths. In this acceptation it occurs in Jeremiah, ii. 22. “For “though thou waſh thee with nitre, and take “thee much ſoap, &c.”

Another uſe in which the nitre of the ancients was employed was the making of glaſs. This we learn unequivocally from Tacitus: (*Hiſt.* l. v. c. 7.) “Belus amnis Judaico mari “illabitur; circa cujus os conlectæ arenæ, ad- “mixto nitro, in vitrum excoquuntur.” Theſe circumſtances evidently prove that the nitre of the ancients muſt have been an alkaline ſalt, utterly deſtitute of nitrous acid.

Geoffroy is of opinion that this alkali was the ſame as ſalt of tartar, or vegetable alkali; but Rouelle's teſtimony that it was the baſe of ſea ſalt or foſſil alkali appears indubitable, both from the account we have of the origin of this ſalt, and from his examination of the ſalt itſelf.

In the firſt place, it was found abundantly in the bed of the Nile, after the ſummer heats had cauſed the evaporation of its waters; and in other parts of Egypt, eſpecially in the neighbourhood of Memphis. Pliny particularly mentions the "nitrariæ Egypti circa Naucratim "& Memphim." The latter place abounded ſo with this ſalt, that it was crowded by perſons collecting and preparing the materials for commerce. Two cities were founded at no great diſtance, each of which was named Nitria, and the whole territory received the ſame appellation.

That the ſubſtance received its name from the country, and not the country from its principal product, is a miſtake into which antiquarians have ſometimes fallen. The origin of the term nitre we have already detected. That a country ſhould be denominated from ſome remarkable circumſtance connected with its ſoil is by no means uncommon. The firſt ſettlers in Attica gave to certain places the names of Phegus, Rhamnus, Myrrhimenta, from the beech, the thorn, the myrtle, which flouriſhed in their reſpective neighbourhoods. The Ionians were denominated from ιον the violet, a flower which they cultivated in large plantations; and hence the poets, as well as the ſculptors and painters, uſed to perſonify the town of Athens (the inhabitants of which were Ionians by origin) in the form of a beauteous and majeſtic female, whoſe temples were encircled with feſtoons of violets.

Secondly, the ſame places celebrated for nitre works by the ancients ſtill abound with the ſame ſubſtance. Now the vegetable alkali, though it partly takes up its reſidence in the mineral kingdom, never appears there in ſuch maſſes, as are deſcribed to have been found in thoſe places. And beſides, ſamples of this ſubſtance having been brought from Egypt to M. Rouelle were examined by that ſkilful chemiſt, and found to conſiſt almoſt wholly of foſſil alkali. (*Mem. de l'Ac. Sc. Paris*, 1750.)

Thus it appears, that the word *nitre* has deviated from its original meaning, ſo as to be applied by us to denote a ſubſtance very different from the nitre of the ancients. But the old ſignification of the word has become obſolete. To revive it now would not merely be pedantic; it might introduce confuſion and error, and certainly would be productive of inconvenience, ſince for nitre and its derivatives, in the modern ſenſe, we have no ſynonyms. This, then, is one of thoſe few caſes wherein the well founded claims of antiquity ought to give way to the more preſſing ones of preſent expediency.

The ſynonyms of nitrous acid remain to be examined. *Phlogiſticated nitrous acid* differs from the name generally uſed, only by a ſuperfluous and hypothetic addition.

Mr. Kirwan, changing the hypothetical term for one expreſſive of a fact, entitles this ſubſtance, *mephitiſed nitrous acid.*

*Spirit of nitre* has been generally uſed to denote the nitrous acid diluted.

*Aqua fortis* is merely a trading name. To preſerve it, however, may not be unuſeful to philoſophers; for it may ſerve to indicate a difference between the pure ſubſtance, properly termed nitrous acid, and the common nitrous acid of commerce, or aqua fortis. Aqua fortis is known to be in general contaminated by an admixture, not only of muriatic acid, but of vitriolic; and of this latter, even after the uſual purifying proceſs by precipitation with ſilver and rediſtillation.

### § 9. *NITROUS VAPOUR.*

This is nitrous acid in an aëriform ſtate. "Mixed with water it inſtantly forms genuine "ſpirit of nitre." (*Pr.* i. 336)

An obvious analogy ſubſiſts between this ſubſtance and ſulfureous air, nitric air, muriatic air, and oxymuriatic air; I mean with regard to their properties of being condenſed by water, and of forming with it fluid acids of the ſame nature eſſentially as the reſpective aëriform acids. It is evident, therefore, that ſyſtematic nomenclature requires either this ſubſtance to be denominated nitrous air, or the others ſulfureous, nitric, muriatic, and oxymuriatic vapours. Unfortunately, however, the name nitrous air was previouſly applied to another ſubſtance, which is in fact ſupernitroſe air; that is, a ſubſtance compoſed of the ſame ingredients as the one of which we are now treating, but in which the proportion of theſe ingredients is materially different; the nitrifying or mephitic part being ſuperabundant, and the acid-educing part ſo deficient, that this nitrous air (as it is called) combined with water, excites no acid ſenſation on the palate, although it turns the juice of turnſol red. (*Pr*. i. 368.) Now general uſe having decidedly affixed to this latter ſubſtance the name nitrous air, and the true aëriform nitrous acid having been diſtinguiſhed from it by another name, (nitrous vapour) it becomes the ſpeculative philoſopher to acquieſce in denominations not ſtrictly concordant with ſyſtematic preciſion, rather than hazard confuſion by changing the ſignification of eſtabliſhed terms. The ſame reaſon forbids our calling the analogous airs vapours, independent of the conſideration, that every vapour is an aëriform fluid.

## § 10. *NITRIC ACID.*

By this name I concur with the French chemiſts in denoting that acid drawn from nitre, which is deſtitute of colour, and emits a white vapour in the atmoſphere.

By ſome Engliſh chemiſts it has been termed *dephlogiſticated nitrous acid.* As all names dependant on hypotheſis are to be rejected, it will not be expected that any exception ſhould be made in this inſtance; but it may be aſked, why not ſubſtitute for dephlogiſticated, here as well as elſewhere, the ſynonym of that epithet which bears no relationſhip to hypotheſis? Why not call this ſubſtance oxynitrous acid? The anſwer to this queſtion reſults from a compariſon of this acid with others. If it reſemble the vitriolic rather than the ſulfureous acid, and the muriatic rather than the oxymuriatic acid, the name conferred on it by the French chemiſts is warranted by analogy. This is the acid which, by union with alkalis, earths, and metals, forms the neutral ſalts termed nitrated, as the vitriolic, with the ſame ſubſtances, forms thoſe termed vitriolated, and the muriatic thoſe termed muriated,

Mr. Kirwan, from an obvious analogy, calls this ſubſtance *demephitiſed nitrous acid.*

## § 11. *NITRIC AIR.*

This is pure nitric acid in an aëriform ſtate. Admitted to water, it is inſtantly and wholly imbibed by it; and the fluid nitric acid reſults.

Dr. Prieſtley calls this air *the pure vapour of the acid of nitre*, (*Pr.* ii. 169. 1ſt. *ed.*) and *nitrous acid air*. (*Pr.* ii. 172.)

## § 12. *MURIATIC ACID.*

This name has been univerſally appropriated to the acid drawn from common ſalt, the "muria dura" of Celſus, Columella, &c. The word muria, which ſignifies brine, is derived â mari; and there is no doubt that the acid of which we are treating abounds in the ſalt contained in the ſea, and probably even exiſts, in a free ſtate, on ſome parts of the ſurface of the ocean.

The word *marine* has frequently been uſed, indiſcriminately with muriatic, to diſtinguiſh this acid; not however in combination with other words; the term marinated has never, as far as I know, been admitted into chemical language. It is therefore neceſſary for us to allow the preference to the word muriatic, in order to preſerve a conformity between the names by which we denote the more ſimple ſubſtance, and ſubſtances compounded with it and others.

*Spirit of ſalt* is a name, which has been generally applied to the dilute muriatic acid. It has juſtly fallen into diſuſe among chemiſts, though it ſtill holds a place with ſpirit of vitriol and ſpirit of nitre among artiſans.

## § 13. *MURIATIC AIR.*

THIS is muriatic acid in an aëriform ſtate. Water combined with it becomes inſtantly a pure fluid acid. (*Pr*. ii. 289.)

It has been ſtyled, more diffuſely than is neceſſary, *muriatic acid air*, and *marine acid air*.*

## § 14. *OXYMURIATIC ACID.*

THE name of this ſubſtance, here adopted, imports its nature; muriatic acid combined with an additional portion of oxygen. Scheele, indeed, and ſome other adherents to the doctrine of phlogiſton, conſidered this ſubſtance as muriatic acid deprived of phlogiſton; but whatever may be the fate of the phlogiſtic doctrine, there is no reſiſting rationally the evidence of oxygen being combined in additional quantity with the muriatic acid in this ſtate. Theſe proofs are forcibly inſiſted on by one of the moſt eminent and ſtrenuous of the old ſect. (*Keir. Dict.* 87. 88.)

This ſubſtance has been termed *dephlogiſticated muriatic* (or *marine) acid*, and *oxygenated muriatic acid.* Why the epithets dephlogiſticated and oxygenated ſhould be rejected has already been ſufficiently explained.

It has alſo been termed *aërated muriatic acid.* The epithet aërated is peculiarly improper, ſince from the time of its application by Bergman to the names of ſubſtances imbued with fixed air, it has been almoſt univerſally conſidered as an appanage of that acid. It has indeed been ſaid by ſome chemiſts, that the ſubſtance in queſtion is muriatic acid combined with fixed air. But, in the firſt place, this opinion has not been held by all who have uſed the term aërated. Secondly, the opinion has not been proved, and therefore ſhould not give the law in nomenclature. Thirdly, it is eaſy to ſhew, that even were this opinion true, the name oxymuriatic acid would not be improper. According to this hypotheſis, if muriatic acid be digeſted with the calx of lead, for inſtance, or mercury, it takes up fixed air from the calx while it parts with a portion of its own phlogiſton. Now, by the ſame hypotheſis, fixed air is compoſed of oxygen air and phlogiſton: conſequently, if fixed air be added to the muriatic acid in proportion as phlogiſton eſcapes from it, the reſult of the proceſs muſt be the ſame as if oxygen air alone had been added to the acid; and this fact is what the word oxymuriatic indicates.

## § 15. *OXYMURIATIC AIR.*

THIS ſubſtance being pure oxymuriatic acid in an aëriform ſtate, the propriety of the name here affixed to it requires no elucidation.

### § 16. *NITROMURIATIC ACID.*

By this I underſtand, with the French chemiſts, a mixture of the nitric and muriatic acids.

It has been commonly termed *aqua regis.*

### § 17. *PHOSPHOREOUS ACID.*

This is phoſphorus impregnated, but not ſaturated, with oxygen.

It has been called *volatile,* and *phlogiſticated phoſphoric acid.*

### § 18. *PHOSPHORIC ACID.*

This is the ſubſtance reſulting from the ſaturation of phoſphorus with oxygen.

### § 19. *PHOSPHORIC AIR.*

This is pure phoſphoric acid in an aëriform ſtate.

### § 20. *FLUORIC ACID.*

The acid thus denominated by its diſcoverer, M. Scheele, has alſo been termed *ſparry acid,* as the mineral from which it is obtained has been known by the names of *fluor* and *fuſible ſpar*. I prefer its original denomination; becauſe the original denominations of things ſhould always be preſerved, if not decidedly improper; becauſe there is ſome ambiguity in the latter name, as there are very different kinds of ſpar; and becauſe the terms *ſparrated* and *ſpathated* have ſeldom, if ever, been employed.

### § 21. *FLUORIC AIR.*

THIS is the fluoric acid in an aëriform ſtate. It has ſometimes been termed *ſparry air*.

### § 22. *BORACIC ACID.*

MOST chemiſts are now of opinion, that a peculiar acid reſides in the mineral ſalt procured from India, called *borax*, or *tinkal-toſkan*: this acid has been generally ſtyled acid of borax, or boracic acid.

It was firſt ſeparated from the foſſile alkali, with which it is conjoined in its native ſtate, by Homberg; who, having effected this ſeparation by means of green vitriol, imagined that the acid was produced from the vitriol; from which circumſtance, and from the medical virtues of this acid, he gave it the names of *volatile narcotic ſalt of vitriol*, and *Homberg's ſedative ſalt*. Theſe names are already nearly obſolete.

## § 23. ARSENITIC ACID.

THIS name has been given by Mr. Kirwan to the calx of arſenic, endued with acid properties.

## § 24. ARSENIC ACID.

THIS is the acid, which M. Scheele produced by impregnating the calx of arſenic with an additional portion of oxygen.

It has been alſo called *arſeniac* and *arſenical acid*.

## § 25. MOLYBDENIC ACID.

THIS is the acid reſulting from the oxygenation of a particular metal called molybdena, or molybden.

The French call it *molybdic acid*, but this name I think exceptionable, as referring not to molybdena, but to Μολυϐδος, which was undoubtedly the ſame ſubſtance as our lead.

### § 26. *TUNSTENIC ACID.*

Although tungſten has not been exhibited in combination with oxygen alone, ſo as to appear manifeſtly entitled to the appellation of an acid, yet "the eaſe with which it unites with "alkalis, and in particular with the volatile "alkali, the compound with which preſents "unequivocal acid properties, is ſufficient to "convince us that it really takes the acid ſtate." (*Luyart's Chem. Anal. of Wolfram.*)

The French call this tunſtic acid. I follow the Swediſh more nearly.

### § 27. *SUCCINIC ACID.*

This is the peculiar acid extracted from amber.

It has been ſometimes called *ſalt of amber*, a name evidently not ſuitable to the purified acid.

It has alſo been called *karabic acid*, becauſe amber was by the Arabians alſo denominated karabe, or alkarabe. But this exotic name is reſorted to unneceſſarily, nay improperly, if it be allowed that new names adopted into our language ſhould be deduced from the Latin in preference to any foreign tongue.

It is of no avail to urge, upon the authority of Pliny, that the name *ſuccinum* was given to this ſubſtance by the Romans, becauſe it was ſuppoſed to be a vegetable *ſuccus*; and that this ſuppoſition being in all probability erroneous, the name originating from it ought to be laid aſide. I have already combated the principle of changing eſtabliſhed words according to changes of ſpeculations concerning the congruity of their nature with their etymologies. Men ſoon ceaſe to contemplate the etymologies of popular names; and, indeed, if they were not to neglect them after the lapſe of a few years, they would be in a ſtate of inceſſant deluſion or incertitude. Did it ever enter into the head of any Athenian to propoſe a new name for ψυχη, ſeriouſly averring that the ſoul is not a butterfly? Or to change the name of tragedy, when the drama ceaſed to be the ſong of the goat? Neither is it of any conſequence to the Engliſh chemiſt, whether the etymology of ſuccinum, which we do know, or that of karabe, which we do not know, be right or wrong. Indeed this circumſtance is rather fortunate, for if the reſult of the inquiry concerning the origin of amber were to involve the deciſion of the queſtion concerning the denomination of its acid, the affair might prove not a little troubleſome, as the chemiſt muſt be at a ſtand, until natural hiſtorians ſhould have ſettled a very litigated point.

### § 28. *FIXED AIR.*

**Although** the acid air extricated by fermentation was known to Mr. Boyle, Dr. Hales, and others, who called it *factitious* and *artificial air*, from having procured it by chemical proceſſes; yet the firſt accurate knowledge of its nature and properties, which the world poſſeſſed, it owes to the venerable Dr. Black, the father of modern chemiſtry. He termed it fixed air, a name by which it has been ſince very generally recognized, not only among chemiſts, but among the people. This univerſality of its acceptation is the beſt reaſon that can be alleged for its being retained in chemical language; ſince it muſt be acknowledged that the intereſts of ſcience would be promoted by accommodating the language of philoſophers, as much as poſſible, to that of the people. It is true, this name does lie open to ſome objections, which, if we were now enquiring, not whether we ſhould preſerve a name already eſtabliſhed, but how we ſhould invent one unexceptionable, would be deciſive againſt its introduction. The ſubſtance it denotes is not the only air capable of being fixed in ſolid bodies; it is not always fixed; and when it actually is fixed it is no longer an air. On the other hand, however, the following conſiderations may be alleged in its favour; that this air was the firſt aëriform ſubſtance known to be capable of being fixed in ſolid bodies, and therefore may be entitled, κατ' ἐξοχὴν, to the epithet fixed; that this name does not miſlead us with regard to the nature of the ſubſtance it is employed to indicate, for it refers to a fact unconnected with any hypotheſis; and laſtly, that the term fixed may be in ſome degree eligible, if we conſider it as a correlative of volatile, ſince fixed air is ſpecifically the moſt ponderous of all the airs with which we are acquainted.

With regard to the various ſynonyms of this ſubſtance, which have been invented to ſuperſede the name conferred on it by the perſon, who may be conſidered as its diſcoverer, I think it fair, that they ſhould ſtand or fall by their intrinſic deſerts.

Bergman having inveſtigated the natural hiſtory of this air, and conſidered its acid as well as its aëriform nature; and having alſo ſuppoſed it to be an eſſentially conſtituent part of the atmoſphere, concluded, "interea jure meritoque optimo, aër fixus *acidum* audit *aëreum*, "vel ſi magis placet *atmoſphæricum*." (*Opuſc.* i. 55. 57.) But with the denomination referring to its acid and aëriform nature, it appears that he was afterwards himſelf diſſatisfied, on account of its univerſality, and wiſhed for one more exact: (*Opuſc.* iv. 258.) and as to his ſuppoſition reſpecting the origin of fixed air, it is now known that he was miſtaken, that acid being merely adventitious in the atmoſphere, and probably not exiſting at all in the higher regions.

The deſignations *cretaceous*, and *calcareous*, invented by M. Bucquet, and Mr. Kier, were not deſtitute of correct analogy, but their correſpondent poſſeſſive adjectives, *cretaceated* and *calcareated*, beſide being leſs ſmooth than aërated, have ſo ſtrong an air of catachreſis, that they have been ſcarcely ever hazarded.

The general objections urged againſt the generic term *gas* militate againſt names, of which that word compoſes a part; and of Van Helmont's ſpecific appellatives, *ſylveſtrous*, and *vinous*, little need be ſaid, as they have no partizans; the former is whimſical and inconvenient, the latter more applicable to the tartareous acid than to this.

But the epithet *carbonic* puts in a different kind of claim to our attention. This acid, ſay the French chemiſts, is compoſed of pure charcoal, or the carbonic radical, and oxygen gas; it ſhould therefore be called carbonic gas.

Here it might be aſked, why thoſe great chemical god-fathers choſe to deviate, in this inſtance, from their favourite font of Grecian etymology? Pure charcoal, methinks, ſhould have been called the *anthractic radical*; this ſubſtance, *anthractic acid gas*; and its combinations, *anthracticates of potaſh*, &c.

But are we ſure that carbone is a conſtituent part of this acid? If any man be of opinion, that inflammable air or phlogiſton is the ſubſtance, which is rendered fixed air by being impregnated with the acid-educing principle, do we not, in as far as we impoſe this language on him, compel him to avow a creed, which his judgment belies? The annunciation of this name is the promulgation of a law in chemiſtry, which the members of the French nomenclatural aſſembly, however reſpectable, not being the conſtitutional repreſentatives of the chemical republic, were not competent to enact.

## § 29. *VINEGAR.*

THE word vinegar has been always uſed to denote the dilute and compound acid obtained by the fermentation of wine, and in that ſtate in which it is ordinarily uſed in diet as a condiment.

diment. By examining the ſubſtance remaining after its diſtillation, we diſcover that vinegar contains, beſide its peculiar acid, ſome oil, ſpirit, an extractive ſaponaceous matter, and ſome tartar.

### § 30. *ACETOUS ACID.*

THIS is *diſtilled vinegar*; an acid by the aid of which peculiar neutral ſalts are formed.

### § 31. *ACETIC ACID.*

THIS is *concentrated* or *radical vinegar*; an acid generally confounded with the foregoing, but which, nevertheleſs, is materially different, and, therefore, demands a different name. I have taken that of the French chemiſts, becauſe in its termination it is analogical with the vitriolic, muriatic, &c., while the ſubſtance it denotes correſponds with thoſe acids in its connexion with oxygen, and in its mode of neutralizing alkalis, earths, and metals. The acetic acid contains more oxygen than the acetous; for M. Berthollet found, that when cryſtals of verdigriſe are diſtilled, in order to procure the acetic acid, the reſidue is nearly revivified copper; ſo much oxygen has been extracted from the metallic ſalt. A different event, it is true, takes place, when metallic neutral ſalts, formed with the vitriolic, nitric, or muriatic acids, are diſtilled; the reſidues are metallic calces: but then the acids obtained in diſtillation are diveſted of their due portion of oxygen; ſo that the very diverſities, in the reſult of theſe proceſſes, prove a previous ſimilarity in the different acids. A further proof, that the acid of which we are now ſpeaking, and not the acetous, correſponds with the vitriolic and the muriatic, and conſequently not (as Mr. Kier ſeems to think, *Dict.* p. 23.) with the oxyvitriolic and oxymuriatic, ariſes from a compariſon of the acetous and the acetic neutral ſalts. The former, as M. Berthollet found, render ſyrup of violets green, but the latter do not alter its colour; the former have a more acrid taſte than the latter, and are not ſo eaſily cryſtallizable.

### § 32. *ACETIC AIR.*

This is acetic acid in an aëriform ſtate. Combined with the different baſes, which have an affinity for acetic acid, it forms acetated ſalts.

M. de la Metherie has termed this ſubſtance *vegetable acid air*. But the word *vegetable* is generic, and compriſes various ſpecies beſide acetic acid.

### § 33. *LIGNIC ACID.*

THIS is the pure acid, which M. Goettling has extracted from wood.

M. Fontana ſuſpects, that a further examination of the acids extracted from different woods may oblige chemiſts to exchange the general term for different ſpecific ones, as, *guiacin acid*, *rhodian acid*, *nephretic acid*, &c. It is probable, however, that when the acids drawn from different woods ſhall be diveſted of their adventitious oils and charcoal, they will be all found poſſeſſed of the ſame properties. M. Goettling extracted the lignic acid from box and from beech indifferently.

### § 34. *EMPYREUMATIC LIGNIC ACID.*

THE acid liquor, which firſt comes over in the diſtillation of wood, is ſtrongly empyreumatic;

matic; and this has been termed by the French nomenclators, *pyro-lignic acid.* I have already entered my proteſt againſt half-Greek, half-Latin compounds, except in caſes where the Greek word has, by uſe, been completely latinized. I may here add, that the formation of *pyro*, from πυρ, is not agreeable to the general uſage of the ancient Greeks. Πυρ was moſtly converted into πυρι before a conſonant, as πυριϐιος, πυριϐρωτος, πυριμορφος, πυριχαλκος. Πυρο before a conſonant moſtly refers to πυρος, as πυρολογος, πυροπωλης, πυροτομια, πυροφορος. Pyrolignic acid, therefore, properly ſignifies *wheaten wood acid.*

Moreover, this name appears objectionable on ſcientific grounds, when we conſider the proceſs whereby M. Goettling obtained the acid which he employed in the compoſition of his lignic ether. By repeated filtrations and diſtillations he ſeparated every particle of oil and charcoal from the acid, which he procured at length perfectly tranſparent, and devoid of empyreumatic ſmell, having only (as he ſays) an odour of garlic. This acid ſeems not to have been yet ſufficiently examined. In the preſent ſtate of our knowledge, I prefer the original mode of ſtyling it: a change of name ſhould at leaſt have the recommendation of being founded on an advance of knowledge.

### § 35. *TARTAREOUS ACID.*

From the cruſt depoſited by wine long at reſt is extracted a peculiar acid, called, from its origin, *acid of tartar*. It is generally held, that this acid is not ſaturated with oxygen, and therefore entitled to a denomination analogous in its termination to the ſulfureous and nitrous acids.

Dr. Black, however, has invented a name for this ſubſtance, which ranks it with the vitriolic and nitric acids: he calls it the *œnolithic acid*, or, as we might ſay in Engliſh, the *wine-ſtone acid*. Suppoſing Dr. Black's to be an " appertinent title," I muſt own I would ſtill prefer the old and well known appellation; the more ſo, as by adopting his we ſhould render a further alteration in our nomenclature neceſſary, for the term *lithic* would become generic, and therefore we ſhould be obliged to denominate the acid hitherto entitled by that name *urolithic acid*.

### § 36. *EMPYREUMATIC TARTAREOUS ACID.*

THIS is the empyreumatic acid obtained from tartar by diſtillation, and preſumed to be impregnated with oleaginous or carbonaceous matter.

By ſome it has been called *ſpirit of tartar*, and *diſtilled acid of tartar*. The French ſtyle it *pyrotartareous acid*.

### § 37. *SACCHARINE ACID.*

ONE of the conſtituent parts of the eſſential ſalt called ſugar is capable of being converted into a peculiar cryſtallizable acid, which, from its origin, has been ſtyled *acid of ſugar*, and ſaccharine acid.

Theſe names have been excepted againſt, upon the preſumption that our ſugar was unknown to the ancient Greeks and Romans. To eſtabliſh this poſition, the learned Beckmann has taken conſiderable pains; (*Hiſt. Sacch. Commentat. Gotting.* t. v.) yet I own that I am not convinced by his arguments. The deciſion of the queſtion is indeed a matter of very little importance, and if I enter into the controverſy, I beg to be conſidered as doing ſo for the ſake of claſſical criticiſm rather than chemical improvement.

The account given of ſugar by Galen is, that it was brought to Rome from India, and Arabia the Happy; that it was reported to have concreted ſpontaneouſly on reeds; and that it ſeemed to be a ſpecies of honey, leſs ſweet, indeed, than theirs, but poſſeſſed of ſimilar properties. Το σακχαρ καλȣμενον ὁπερ εξ Ινδιας τε ϗ της ευδαιμονος Αραβιας κομιζεται· Περιπηγνυται μεν, ως φασι, καλαμοις, εϛι δε τι ϗ αυτο μελιτος ειδος 'Ηττον μεν ȣν εϛιν, ἡ το παρ ἡμιν γλυκυ· (*Gal. de ſimp. med. fac.* l. vii. c. 9.)

Similar accounts of this ſubſtance are given by Dioſcorides and Pliny, the only other ancient authors who treat of it.

Let us now enquire how far this ſubſtance agrees with the modern ſugar. Our ſugar is extracted from the expreſſed juice of a reed, called by ſir Hans Sloane, Arundo Saccharifera, and by ſir Charles Linnè, Saccharum Officinarum, which certainly grows in India and Arabia Felix, as well as in thoſe colonies from which we moſt frequently procure it. The ancient ſugar, however, it ſeems, was a ſpontaneous exudation. But here two conſiderations naturally ariſe, which tend to reconcile theſe differences. Firſt, the cultivators of our Weſt India ſugar cane do not permit the plant to grow old enough to pour forth ſpontaneous tears, becauſe, after a year or two, it becomes woody, and loſes its moſt profitable juice. Secondly, it is reaſonable to ſuppoſe, that this ſpontaneous ſugar ſhould appear both ſooner and in greater abundance under the ſteady glowing ſun of Arabia Felix and Indoſtan, than in the irregular climate of the Weſt Indian iſlands.

The identical ſugar cane, however, from which our ſugar is extracted, does, under certain circumſtances, yield a ſpontaneous exudation, which exactly correſponds to the Eaſt Indian import of the Romans, deſcribed by Dioſcorides, Galen, and Pliny, under the names of σαϰχαϱον, σαϰχαϱ, and ſaccharum.

From a number of authorities extant, which bear teſtimony of this fact, I ſhall quote but two; the reſpectable Matthiolus, and the juſtly celebrated Caſpar Bauhine. The former, treating of this ſubject, ſays, "ſed an quid pluribus "de his diſputandum, cum multorum teſtimo- "nio jam notum ſit in inſulis quas Cannarias, "et Divi Thomæ appellant, in iiſdem ſane "calamis a quibus ſaccharum exprimunt, il- "lud etiam per ſe gigni, et aperto arundinis "latere manare, et gummi modo coaleſcere? "Quibus facile ſubſcribunt ii qui hoc ævo in "Indiam navigant. Etenim ad Bethecalem "Indiæ utrumque jam vendi affirmant." (*Matthioli op.* i. 76.) And Bauhine teſtifies, "re- "periri interdum in ea arundinis parte qua "folia genicula amplectuntur, ſacchari micas "vel lacrumas, piſi magnitudine concretas, ſolis "calore excoctas, interdum pellucidas, inter- "dum candicantes & non pellucidas." (*Theatr. Botan.* 298.)

Thus it appears that, even allowing the ancient ſugar to have been a ſpontaneous exudation, there is every reaſon to believe it the product of the ſame plant, which furniſhes the expreſſed juice whence the modern ſugar is extracted. But it deſerves to be remarked, that Galen, in his account of the origin of ſugar, ſpeaks only from report, and ſays, rather in a looſe way, ως φασι. Now I think it probable, that there were other reports of a different kind concerning this matter, and that even the manufacture of ſugar, according to the modern cuſtom, was in a great meaſure underſtood at Rome. Lucan ſays,

> "Quique bibunt tenera dulces ab arundine ſuccos;"

and Statius,

> "Et quas præcoquit Eboſia cannas."

Laſtly, Varro Narbonenſis gives the following circumſtantial account of the proceſs, in which, however, we obſerve that he was evidently miſinformed with regard to one particular:

> "Indica non magna mimis arbore creſcit arundo,
> "Illius & lentis premitur *radicibus* humor,
> "Dulcia cui nequeant ſucco contendere mella."

Upon the whole (however we may acknowledge the concluſion to be a matter of curioſity rather than of importance) it appears probable, that there is neither any error in natural hiſtory involved in denominating the produce of the ſugar cane, ſaccharum, nor any claſſical tranſgreſſion in terming an acid produced from it ſaccharine acid.

A more plauſible objection to the employment of this name might be advanced on chemical grounds. This is neither the only acid obtainable from ſugar; nor is it obtained in the greateſt abundance from that ſubſtance. For, on the one hand, ſugar may be made to yield, by different proceſſes, tartareous acid, malic acid, vinegar, fixed air, and empyreumatic ſaccharine acid, beſide the acid of which we are now treating; and on the other hand, ſugar, by treatment with the nitrous acid, yields but *one third* of its weight of ſaccharine acid; (*Bergman*); whereas wool, by a ſimilar proceſs, yields *half* its weight of the ſame acid, (*Berthollet. Jour. de Phyſ.* 1785.); ſo that this acid ſeems to have a better claim to the title of *lanal* than ſaccharine.

As this acid, however, is well diſcriminated by its peculiar properties, particularly by its capability of being cryſtallized, from the others which ſugar may be made to yield, there is ſufficient propriety in terming it, by way of eminence, the ſaccharine acid, conformably to the denomination of the philoſophers, who firſt revealed to us its exiſtence and nature.

The French have preferred diſtinguiſhing this acid by the title *oxalic*, partly becauſe chemiſts have known, for above a century, that an acid (which however Scheele firſt diſcovered to be the ſame with the ſaccharine) exiſts in the ſorrel, eſpecially the wood-ſorrel, or *oxalis acetoſella*; partly becauſe this acid is moſtly prepared in Switzerland and Germany from the acidulous ſalt, or ſuperſaccharated vegetable alkali procured from the expreſſed juice of ſorrel. To theſe reaſons might have been added an obſervation of Scheele's, (*Crell's Jour.* i. 111.) which would eſpecially juſtify this title, or ſtill more that of *acetoſellan acid*, by which ſome late writers have diſtinguiſhed it; "that "the ſame acid, which we prepare artificially "from ſugar, exiſts, ready formed by nature, "in the wood-ſorrel." This conſideration, however,

ever, leads to an inveſtigation, that ſuggeſts exceptions againſt both of theſe names. If we prefer denominating it from the genus, (oxalis) rumex puts in a counterclaim, for the ſame acid is yielded by the rumex acetoſa: if we reſort to the ſpecies, (acetoſella) the oxalis corniculata and ſome other ſpecies allege an equal title upon the ſame grounds.

The principal circumſtance which favoured the introduction of the name of *acid of ſorrel* was the opinion of Bergman, that this acid is not the ſame with the ſaccharine, which he founded upon his not being able to produce an acidulous ſalt of ſorrel by ſuperſaturating the vegetable alkali with ſaccharine acid. This, however, having been accompliſhed by both Scheele and Weſtrumb, there ſeems to be a peculiar propriety in diſcontinuing the uſe of terms founded upon an error.

### § 38. *EMPYREUMATIC SACCHARINE ACID.*

THIS is an empyreumatic acid obtainable by diſtillation from ſubſtances which contain ſugar.

By the authors of the Encyclopédie Méthodique it was denominated *ſyrupous acid.* By other authors it has received different names, according to the different ſubſtances from which it has been extracted, *acid ſpirit of honey, of manna, of gum, of corn, pyro-mucous acid.*

Mr. Kirwan has improved upon the laſt of theſe names, by exchanging the latter of its component parts, mucous, for ſaccharine, entitling it *pyro-ſaccharine acid*, as it ſeems to bear the ſame relation to the ſaccharine acid that the empyreumatic lignic and tartareous acids do to the pure lignic and tartareous acids.

### § 39. CITRIC ACID.

THIS is the acid procured from the fruit of the Linnean citrus medica.

It has been called by the authors of the Encyclopédie Méthodique *citronian acid*, and by Mr. Kirwan, *citronic acid.* Theſe names do not appear ſo properly formed from *citrus* as *citric* and its poſſeſſive *citrated*, which I adopt from the new nomenclature of the French.

It has been alſo called *acid of lemons.*

## § 40. *MALIC ACID.*

M. Scheele, having obſerved that while the juices of moſt fruits contain two ſpecies of acids, the juice of apples contains but one of theſe, and that abundantly, properly entitled this, *acid of apples*, or, as the French tranſlate it, malic acid, deducing the denomination from the pyrus malus of Linnè.

It has ſometimes been called *maluſian acid*; but without any regard to analogy.

Mr. Kirwan has called it *malacic acid*; but this epithet rather leads the mind to μαλαχη, the mallow, than to malus.

## § 41. *GALLIC ACID.*

M. Scheele has well remarked, that all the plants termed aſtringent betray unequivocal ſigns of a peculiar acid, which, therefore, might have been termed the *aſtringent* acid; but which, having been firſt accurately detected in galls, has obtained its denomination from theſe neſts of the cynips quercus folii.

### § 42. CAMPHORIC ACID.

THIS is the peculiar acid obtained by Mr. Koſegarten from the concrete eſſential oil of the Linnean laurus camphora.

### § 43. BENZOIC ACID.

THE peculiar acid extracted from benzoë (which is yielded by the Linnean ſtyrax benzoin) has been thus denominated in the new nomenclature of the French.

By Mr. Kirwan it has been called *benzoinitic acid*; but as he has applied the termination *itic* to the names of acid metallic calces, I think it had better be reſerved wholly to their uſe.

### § 44. CICERIC ACID.

IT is related by Gioberti, in a letter to Brugnatelli (*Biblioteca fiſica d'Europa*, viii. 632.) that a new vegetable acid has been diſcovered by Carrere and Angulo, which they have extracted from the chick-pea or cicer arietinum of Linnè, a plant of the leguminous tribe, common in Spain. This acid is ſaid to be ſo ſtrong as not to be inferior to the common vitriolic acid. It corrodes leather inſtantly. In odour it bears ſome affinity to the formiceous acid. If this be really a peculiar acid, the name here conferred on it will probably be conſidered as unexceptionable.

### §. 45. *SUBERIC ACID.*

**Brugnatelli** (*Jour. Phyſ. Aou.* 1787.) informs us, that by diſtilling four times its weight of nitric acid from cork, a peculiar acid is obtained.

Nicholſon (*Firſt Princip. of Chem.* 439.) makes mention of it under the title of *acid of cork.*

### § 46. *SEBACEOUS ACID.*

**The** acid obtained by the diſtillation of fat and ſpermaceti, of butter of cocoa, and probably ſome other vegetable oils, has been generally ſtyled *acid of fat*, or ſebaceous acid. This acid appears to be not ſaturated with oxygen, and therefore entitled to the name it has received in preference to *ſebacic acid*; for with the aſſiſtance of heat it expels the acid from vitriolated foſſil alkali, which, by the abſtraction of part of its oxygen in that operation, is rendered ſulfureous acid.

This acid, by being fully impregnated with oxygen, appears to be converted into the ſaccharine. (*See Crell's An.* 1786.)

It is proper that we ſhould preſerve the name of ſebaceous acid, in preference to that of *acid of fat*, (or as M. Leonhardi calls it *fettſaure)* leſt it might be confounded with the hypothetical *acidum pingue* of Meyer, which is ſometimes called by thoſe names, (particularly fettſaure) by M. Wenzel and other German chemiſts.

## § 47. *LACTIC ACID.*

THE acid contained in the whey of milk, after the ſeparation of its earth, mucilage, and eſſential ſalt, has been thus denominated.

The French reformiſts, fond of the more recondite etymologies, deduced their name from the Grecian fount, and entitle it *galactic acid*, though *galactinic acid* would have been more claſſical.

### § 48. SACLACTIC ACID.

THE peculiar acid, the radical of which was diſcovered by the illuſtrious Scheele to reſide in ſugar of milk, has received complex names from the combination of two circumſtances not neceſſarily related; its origin, and the predominant quality of its radical, uncombined with oxygen. The long names of *lactiſaccharine*, *ſacchogalactic*, and *ſaccharolactic*, ſeem leſs eligible than that formed from the latter by ſyncope, according to the authors of the Encyclopédie Méthodique.

### § 49. LITHIC ACID.

THE acid of urinary ſtone was thus denominated by M. Scheele, its diſcoverer.

It has been ſometimes, and not injudiciouſly, called *lithiaſic acid*; although I think its original name ought to be adhered to.

It has been alſo called the *ouretic acid*, though this etymology demands *uretic*.

### § 50. *LACCIC ACID.*

The acid of the waxy matter, produced by the white lac coccus, has been thus denominated by its diſcoverer, Dr. Pearſon.

### § 51. *FORMICEOUS ACID.*

The acid obtained from ants, the formicæ rufæ of Linnè, appears not to be ſaturated with oxygen, from its blackening the vitriolic acid, and being decompoſed by the nitric and oxymuriatic; it is therefore rightly denominated formiceous.

The French entitle it *formic acid*; though, had they been conſiſtent in their etymologies, they would have ſtyled it, with Dr. Hopſon, *myrmecic*.

### § 52. *SERICEOUS ACID.*

The acid extracted from the chryſalis of the ſilkworm is thus denominated by Mr. Kirwan.

The French entitle it *bombyc acid*.

### § 53. *PRUSSIC ACID.*

The tinging matter of Pruſſian blue is aſcertained to be a peculiar acid. Its ſingular volatility, and reluctance to union with alkalis and earths, except by the intermediation of a metallic calx, rendered the inveſtigation of its nature and properties, for a long time, extremely difficult, and even led ſome to conclude it to be merely the phoſphoric acid in a peculiar ſtate of combination. Theſe difficulties are now, however, in a great meaſure removed.

# CHAPTER V.

## NAMES *of* ALKALIS.

### § 1. *DENOMINATION OF ALKALIS IN GENERAL.*

ALKALI is originally an Arabic word. It is compounded of the particle *al*, equivalent to our article *the*, and *kali*. The word kali is Hebraïc alſo; and in both languages its ſtrict and primary ſignification is parched, or burned.*

Kali was ſecondarily applied in the concrete, to ſignify different things which were parched. Firſt, parched fruits in general; ſecondly, parched pulſe in particular. Of this we have an example in 2 Samuel, xvii. 28. where we are told that David, when a fugitive in the deſart, received from the Ammonites and Gileadites, wheat, and barley, and flour, and *kali*, and beans, and lentiles, and *kali*. The vulgar tranſlation is thus printed "wheat, and barley, "and flour, and parched *corn*, and beans, and "lentiles, and parched *pulſe*." The words *corn* and *pulſe* are marked in italicks, to denote that they interpret the ſenſe, but do not literally tranſlate any correſpondent Hebrew word. The word kali, or parched, is repeated twice in the ſame verſe in the original; the firſt time, joined with wheat, barley, and flour, it means parched fruit in general, or parched * corn; the ſecond time, joined with beans and lentiles, it means parched pulſe.

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* See *Bochart Hierozoici pars alt. Op. om.* iii. 38. *ed. Leuſden* 1692. The Hebrew language frequently adopted foreign names, which were written ſo as to appear like Hebrew, or at leaſt reducible to four radical letters.

This latter became in time the more common acceptation; becauſe the ancients, in moſt nations, uſed parched pulſe as a common article of diet. Thus Ariſtophanes talks of Ανθρακιζων τȣ ῤεϐινθȣ; and Plautus,

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* As it is tranſlated in Levit. xxiii. 14. Ruth, ii. 14. 1 Sam. xvii. 17. and xxv. 18.

"Tam frictum ego illum reddam quam frictum eſt cicer;"

and, what is more to our purpoſe, the Arabians to this day call parched pulſe kali.

A third meaning was affixed to the word kali, which naturally flowed from the preceding. It was uſed, under certain circumſtances, as a ſynonym for *uſnen*. Let us enquire what this uſnen was. "Uſnen," ſays Avicenna,* "is of "many ſpecies; the moſt ſubtle of which is "white, and is called dove's dung; the hot-"eſt is green. As to its operations and pro-"perties, it is abſterſive, mundificative, and "aperient." From this account of Avicenna's we may readily infer that uſnen was not literally dove's dung, but that one ſpecies only of this uſnen was ſo called metaphorically. To explain this we muſt obſerve, that uſnen was a plant of the pulſe tribe, which was applied to different purpoſes; to diet, to medicine, and to manufactures. In the firſt caſe the pulſe were parched, or rendered kali, as we have

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* Lib. ii. Trac. 2. cap. 724.

juſt

juſt now explained it; in the latter caſes the plant was burned, and its aſhes prepared for the manufacture of ſoap and glaſs, and for an aperient and detergent medicine. A particular preparation of theſe aſhes, of a white colour, and of more active qualities than the others, ſeems to have been termed metaphorically dove's dung. Afterwards, through the inaccuracy of the vulgar, who only diſcriminate as far as they ſee immediate occaſion for diſcrimination, the name dove's dung was uſed as a general ſynonym for the parched pulſe of the plant uſnen. This appears from 2 Kings, vi. 25. "And there was a great famine in Samaria; "and behold they beſieged it, until an aſs's "head was ſold for fourſcore pieces of ſilver, "and the fourth part of a cab of dove's dung "for five pieces of ſilver." A cab was a ſmall meaſure of corn*, and the dove's dung, which bore ſo high a price at this time of ſcarcity, was undoubtedly eſculent pulſe.

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* Heſychius ſays, it was a general meaſure of liquid as well as dry matters; but Bochart proves that he was wrong. The wine meaſure was a *cad*. Thus Horace (for the word paſſed over into Rome):

"Quo Chium pretio cadum
"Mercemur?"

Uſnen was thus deſcribed by the Arabian Albacra. "A plant without leaves, which has "ſlender ſucculent ſtalks, like roots, that con-"tinue growing till they contain a denſe wood, "by which a very hot fire may be obtained. "Its odour and ſmoke are abominable; its taſte "ſaltiſh; it is of the pulſe tribe."

We come now to prove that the aſhes of this uſnen were called kali.

The Arabians relate, that the aſhes of uſnen were employed in the making of ſoap. The Hebrews ſay the ſame thing of kali. The Arabians alſo uſe kali and alkali to denote the ſaline aſhes of a plant of the pulſe tribe. Abuchanipha ſays, "alkali is extracted from the "pea, but the beſt is produced from *albora*, "which is the kali of dyers, as the other "kinds are of glaſs makers." And Alcamus ſays, "alkali is a thing which is procured by the burn-"ing of pea plants."

Thus kali or alkali became the name of the ſaline aſhes extracted from certain vegetables, which were uſed in the manufactures of ſoap and glaſs. In proceſs of time it was diſcovered, that other plants, beſide thoſe of the pulſe kind, would yield ſaline aſhes capable of being converted to the ſame uſes. Theſe plants were on this account termed kali. They are thus deſcribed by Proſper Alpinus, in his book on the plants of Egypt, (*Cap.* 43.) “ Kellu, noſtri “ quoque kalli, plantæ tres utique in Egypto “ ſpecies aluntur; ex quibus omnibus combuſtis “ cineres fiunt ad vitra, ſaponem, et alia “ multa. Prima ſpecies eadem eſt planta cum “ ea quæ kalli geniculatum appellant. Altera “ eſt quam nonnulli album kalli vocant. Tertiaque, Egyptiis magis propria, foliis conſtat paucis, ajugæ foliis proximis, ſed valde “ longioribus, uno cauleque non omnino “ recto, a quo tres quatuorve cauliculi exoriuntur, qui recte furſum feruntur; quilibetque “ ipſorum in cacumine ſcapum quinque aut “ plus foliis chamæpythios proximis, at deorſum in arcum recurvatis, inclinantibus conflatum, a cujus medio floſculi, roſarum ſimiles, exſurgunt multi.—Hæ omnes plantæ “ ſalſæ, atque acri ſapore linguam feriunt. Hæ

"plantæ ſub anthyllidis ſecundæ genere re-
"ponendæ ſunt."

The ſaline aſhes obtained from theſe ſeveral plants have been univerſally termed alkali; and by the ſame appellation the aſhes of all plants whatſoever, capable of yielding ſimilar products, have been ſince denominated. As the ancients made no diſcrimination between the different kinds of fixed alkaline ſalts, either of which ſerve for ſcouring, and for making ſoap or glaſs, it is evident that kali or alkali is properly a generic term.

The ſpecific diviſions, to which a more accurate knowledge of alkalis gave riſe, were, firſt, into fixed and volatile; and ſecondly, of the fixed, into vegetable and foſſil. Had the alkalis been at once divided into vegetable, foſſil, and animal, the diviſion would have been ſtill more correct and ſcientific. For the firſt ſpecies of alkali may be extracted in greater or leſs quantity from the aſhes of, perhaps, all vegetables, and is not a product ariſing from combuſtion, but pre-exiſts in the living plant: The ſecond ſpecies of alkali is dug out of the earth; and although it can be alſo derived from the ſea, and from certain vegetables, eſpecially thoſe of the marine tribe, yet it may be well characteriſed by the means which point out the ſource whence it can be moſt abundantly deduced. The third ſpecies of alkali is chiefly of animal origin.

The object of contemplation of the ancients, when they employed the word alkali, was not the aſhes, conſidered as an heterogeneous compound, but that ſubſtance which eſſentially ſerved to combine with oil, and with ſand, to conſtitute ſoap and glaſs. This is evident from their denoting this ſubſtance, not by the word, which ſignified in general aſhes, but by a peculiar term appropriated to alkaline aſhes; and alſo from their diſcriminating different kinds of kali, more or leſs pure. Hence we ſee the propriety of uſing the terms vegetable, foſſil, and volatile alkali, in a ſtrict ſenſe, to ſignify thoſe ſaline ſubſtances in their moſt perfectly pure and uncombined ſtate.

We proceed now to enquire into the objections, which have been urged againſt theſe ancient and well known names; and to examine the principal ſynonyms which have been introduced with a view of ſuperſeding them.

The objections made to the names vegetable, foſſile, and volatile alkali, refer chiefly to their length, and their conſiſting of two parts; from which circumſtances, it has been alleged that words compounded with them muſt be very inconveniently long. I grant that if the old names of the three pure alkalis had conſiſted each of but one part, the language of chemiſtry would in ſo far have poſſeſſed more convenience and concinnity; and the ſame poſition I think might be affirmed of the names of the ſeveral acids.

But here two obſervations occur; firſt, that it is impoſſible to conſtruct a language by compounding words, according as ideas are compounded, beyond one or two degrees, without rendering ſeveral technical terms, for which we have frequent occaſion, inconveniently and ridiculouſly long. The French chemiſts have exemplified the failure of ſuch an attempt in a ſtriking manner, ſome of their names for ſubſtances in ordinary uſe taking two or three ſeconds to be pronounced, as for example, *l'oxide rouge* *de mercure par l'acide nitrique*, for ſubnitrated mercury; *le tartrite de potaſſe tenant antimoine*, for ſtibiated tartar.

The ſecond remark which I think worthy of attention is, that words which have little meaning, as articles, conjunctions, auxiliaries, &c. ought to be ſhort; but that words of more important meaning, and leſs frequent uſe, may admit of a more complex articulation; ſo that if we confine our compound names of neutral ſalts in general to the expreſſing of combinations of one acid with one alkali, one earth, or one metal, we ſhall have names by no means too long for the ſubſtances they are to denote, even though we ſometimes employ, as conſtituent portions of thoſe compounds, names which conſiſt of two parts.

However, if chemiſts ſhould in general be perſuaded that "ſimple ſubſtances, at leaſt ſuch "as are ſo relatively to the actual ſtate of our "knowledge, ſhould be denoted by ſimple "names," *(Mr. Kirwan)* and that on this account the alkalis ſhould receive ſynonyms conſiſting each of a ſingle word; thoſe of Mr. Kirwan, which I ſhall preſently mention, appear to me to deſerve a preference above the reſt.

### § 2. *VEGETABLE ALKALI.*

THE German name *potaſche*, which tranſferred into other modern languages participates of its original uncouthneſs and vulgarity, and which latinized is plainly barbarous, was technically introduced as a ſynonym to pure vegetable alkali in the form of *potaſſa* by Bergman, in that of *potaſſe* by the French neologiſts, and in that of *potaſh* by their Engliſh admirers.

This word in its primary ſignification was generic, being ſynonymous with kali; and until the time of Bergman was employed to ſignify the lixivious aſhes of whatever vegetables were employed in the making of glaſs and ſoap; having been conſidered as indiſcriminately * applicable

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* This having been doubted, I ſubjoin popular inſtances to eſtabliſh what I allege.

" La potaſſe a les propriétés de tous les ſels alkalis fixes " . . . . elle ne diffère de la ſoude, que parceque cette " derniere eſt melée de ſel marin." (*Encyclopédie*; *Yverdon* xxxiv. 718.)

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plicable to the vegetable and the foſſil alkali. The name aroſe from the aſhes being lixiviated by boiling them in iron veſſels or *pots*, in which, after decanting the ſupernatant lye when clear, and evaporating the remainder of the water by additional heat, an impure alkaline ſalt was obtained. The ſalt firſt obtained in this way was extracted from plants which are now known to yield principally foſſil alkali; viz. the ſeveral ſpecies of ſalſola and ſalicornia, the meſembryanthemum nodiflorum, and chenopodium maritimum of Linnè. Afterwards, however, potaſh was for the moſt part obtained, eſpecially in Ruſſia, Sweden, Lithuania, Poland, and the Ukraine, from wood aſhes, which were richly fraught with vegetable alkali.

Of theſe aſhes the manufacturers diſtinguiſh three kinds, according to their different degrees of impurity or purification: *ardaſche*, or aſhes

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" In the Hebrides kelp or potaſh is made of the aſhes " of the fucus veſiculoſus of Linnè." (*Encyc. Brit. Edin.* 1783. x. 90,91.)

Now theſe aſhes are known to yield principally foſſil alkali.

not depurated; *potaſche*, or aſhes which have undergone ſome degree of refinement; and *perlaſche*, or aſhes which have been ſtill farther purified, ſo as to have acquired a kind of pearly white colour. By chemical trials it is diſcovered that each of theſe ſorts contains, beſide aërated vegetable alkali, more or leſs vitriolated vegetable alkali, muriated vegetable alkali, vitriolated lime, aërated lime, argil, and iron; beſides, occaſionally, a little charcoal.

Thus we ſee that if the vegetable alkali be termed potaſh, the ſame name will have different acceptations in the mouths of ſpeculative and of operative chemiſts. And here it might well be aſked, By virtue of what privilege does the philoſopher encroach upon the property of the merchant, and endeavour to pervert the uſe of one of his names, without which he cannot tranſact his buſineſs? The attempt is uſeleſs, for the popular ſignification of potaſh will probably continue as long as commerce ſhall ſubſiſt: the attempt is impolitic, becauſe the philoſopher muſt deal with the merchant, and muſt therefore occaſionally employ the newfangled name in its old ſenſe, to denote the commodity which the latter vends: laſtly, the attempt, in this inſtance, ſeems to have been peculiarly ill executed, ſince a name is ſelected to denote vegetable alkali which in its primary ſenſe means alkali in general, in its firſt ſpecific application means foſſil alkaline aſhes, and in its laſt ſpecific application means neither the raw vegetable alkaline material, nor that material manufactured in its greateſt degree of purity, even as an article of commerce.

The word *kali*, with the addition of *purum*, was lately introduced by the college of phyſicians of London, to ſignify vegetable alkali; but why, I muſt own, I have not been able to diſcover. To uſe old words in different acceptations from thoſe in which they were either anciently uſed, or have been ſince generally received, appears to me ſo unjuſtifiable, that I am inclined to doubt, whether thoſe learned philoſophers recollected that kali was anciently a generic term, to which the foſſil alkali was the means of giving birth; and that in modern times the name has been hitherto wholly confined to plants which yield foſſil alkali. Indeed if we were to conſult the ſpirit of the

Arabic tongue, as we ſhould when we tranſplant any of its produce into ours, we ſhould always reject the article al, when we either prefix a ſpecifying epithet or the ſynonymous article the. Thus we ſhould ſay the vegetable, foſſil, or volatile kali, or the kali in general, when we chuſe to avoid ſpecification.

The deſire of procuring one word to denote the vegetable alkali, and the glaring impropriety of the terms potaſh and kali, induced the college of phyſicians of Edinburgh to invent the word *lixiva*.

This word is indeed claſſically deſcended, and not inelegant in its form; but I apprehend that its genealogy has been miſtaken, and that it has been ſuppoſed to be allied to a family to which it does not belong.

The etymology of lixiva is rather obſcure. The moſt probable conjecture, in my opinion, is that lix was formed from lixen, an old Latin word which ſignified water, and which lexicographers ſay was derived from liquo, though I think it more probable that liquo was derived from it.

Water ſaturated with the ſaline part of the aſhes of twigs, bean-ſtalks, &c., was held in much eſtimation at Rome as a medicine, and was called, after lix, lixivium. Thus Columella ſays, “ In ollâ novâ fictili amplâ, præparata “ lixivia cineris ſarmenti calefieri oportet:” and Scribonius Largus recommends, in caſes where diſtreſsful ſymptoms have ariſen from the ſwallowing of gypſum, “ adjuvari qui his “ malis vexantur lixivio e ſarmentorum cinere “ facto, quamplurimum epoto.”

The aſhes uſed in the preparation of lixivium then came to be entitled cinis lixivius, and cinis lixivus; as we read frequently in Columella and Pliny.

Thus the former; “ Sunt qui culmos fabæ “ exurant, & ex eo quod cremaverint, cine- “ rem lixiviam faciunt.”

Scribonius Largus, or his tranſlator, in his formula for the emplaſtrum Επισπαϛικον, preſcribes thus: “ Ceræ P. libra, Reſinæ Terebinthinæ P. “ libra, Nitri rubri P. libra: hoc teritur ex ci- “ nere lixiva, donec leve factum habeat mellis “ ſpiſſitudinem:” &c.

Whether the original ſignification of lix was ſubſtantival, and exactly the ſame as lixen, or adjectival, intimating reſemblance to, or poſſeſſion of ſome of the qualities of water, we ſeem to have now no guide to determine us but probability.

Philologiſts have perplexed the hiſtory of theſe terms by ſuppoſing, that the Romans ſometimes underſtood by the word lix the aſhes themſelves which were uſed in the preparation of a lye, as at other times they did the water, or lye. Nonius ſays, "Lix cinis eſt, vel humor "cineri miſtus; nam etiam nunc id genus lixivium vocatur." And various lexicographers, copying one another as uſual, aſſert after him the ſame thing. But there are no paſſages in the ancients, which I can diſcover, to warrant ſuch an interpretation. The following in Pliny (*l.* xxxvi. *c.* 37.) has perhaps been the ſource of their error: "Ad convulſa viſcera aut con-"tuſa, ut M. Varro; (ipſis enim verbis ejus "utar) lix cinis eſt, inquit, foci. Inde enim "cinis luxatis potus medetur: ut licet videre "gladiatores cum deluſerint hac juvari po-"tione." I have ſeen this partially quoted, "lix "cinis eſt," as if cinis were a definition of lix; whereas the context ſhews, that old Varro (who appears in Pliny's days to have been an antiquated writer) uſes lix as an adjective, in the ſame ſenſe as others uſed lixivus and lixivius.

The application of any of the derivatives of lix to any preparation of aſhes and water appears, therefore, to have been made in right of the liquid, and not in right of the aſhes; and this inference is further corroborated by the uſe of the term in caſes where aſhes were not employed at all, and where conſequently the idea of a ſaturated or richly impregnated liquor could have been the only object of contemplation. Thus in Columella we have "lixivum "vinum;" and again, "muſtum lixivum, hoc "eſt antequam prelo preſſum ſit, quod in lo- "cum muſti fluxerit."

From theſe conſiderations I apprehend that if the Romans had thought proper to uſe the word lixiva as a ſubſtantive, they would have employed it to denote what we ſometimes, but improperly, ſtyle ſolutio, or a liquor holding ſome ſubſtance diſſolved in it.

In addition to theſe objections againſt the uſe of lixiva as a ſynonym for vegetable alkali, it may be obſerved that, even in the mode in which the college of phyſicians uſe this term, there is ſomething reprehenſible. The ſame word in different titles muſt be received in different acceptations. In lixiva ex tartaro, and in lixiva purificata, we are to underſtand by lixiva a combination of the vegetable alkali and fixed air. In lixiva vitriolata we are to annex no other idea to lixiva than that of pure vegetable alkali.

From the compound name *ſalt of tartar*, Mr. Kirwan has formed the modification TARTARIN; and to this name I confeſs I ſee no objection except its novelty.

### § 3. *FOSSIL ALKALI.*

I PREFER the word foſſil to mineral in the denomination of this alkali, for the ſake of rendering our Engliſh chemical language more nearly allied to the Latin. The word *mineralis*, which has been ſometimes uſed, is not claſſical. It was formed by the coiners of barbarous Latin from the Italian *minera*, a vein of metallic ore; derived from *mine*, a ſubterranean paſſage.

*Nataron* and *natron* are corruptions of nitron, which we have already ſhewn was formerly uſed to denote the foſſil alkali in the ſtate in which it was found in Nitria. The London college of phyſicians has revived the latter of thoſe corruptions, uſing it with the adjunct *præparatum* to expreſs the foſſil alkali combined with fixed air, and the water of cryſtallization; and uſing it with adjectives derived from the names of other acids to expreſs the ſame ſubſtance deſtitute of fixed air, but combined to the point of ſaturation with thoſe acids reſpectively. The original word nitre having entirely changed its primary ſignification, and been long attached to a particular neutral ſalt, there is an evident impropriety in reviving one of its corruptions or ſynonyms to expreſs a different ſenſe from that in which the original is univerſally received. But not only natrum is made to differ from nitrum, but the natrum of the college of phyſicians is made to differ from the natrum of ancient and modern commercial dealers. The natrum of thoſe is ſometimes pure, ſometimes aërated foſſil alkali; the natrum of theſe is the compound product of the Egyptian ſoil.

" J'ai reçu d'Egypte," ſays M. Rouelle,

"deux eſpèces différentes de *natrum*, l'un que "l'on eſtime comme le plus parfait, & qui "coute beaucoup plus cher que l'autre. Ce "premier *natrum* n'eſt que du ſel de ſoude, "ou la baſe du ſel marin, melée à preſque un "tiers de ſable, & il ne contient que très-peu "de ſel marin. Le deuxième *natrum*, ou le "commun, eſt du ſel marin, auquel eſt melée "une très-petite portion de ſel de Glauber, & "de la baſe du ſel marin." (*Mem. de l'Ac. Sc. Par. an.* 1750. *p.* 127.)

The native foſſil alkali of Barbary, which is found in great abundance in the inland parts of the country about twenty-eight days journey from Tripoli, is much purer than that of Egypt. It is always found in a cryſtalline ſtate, and though never cauſtic is 50 per cent. ſtronger than ſoda. (*Bagge, Stockholm Acts*, xxxiv. 140.) This the natives call *trona*; (*Monro, Phil. Tranſ.* lxi. *art.* 52.) And Dr. Black conſiders this name, which is ſo ſhort, ſmooth, and unambiguous, as a fit ſubſtitute for foſſil alkali in philoſophical language. The objections to which I perceive this name liable are not, I confeſs, of much importance. The chief of them is that trona is a commercial name, ſignifying a remarkably pure, native *aërated* foſſil alkali: the ſubſtance of which chemical language ſeems to require a name is *mere* foſſil alkali; and certainly the converſion of commercial names to philoſophical uſes ſhould be made, if poſſible, without any perverſion of their original meaning.

Soda is the only ſynonym for foſſil alkali which has been much in uſe. Its primary ſignification, however, or even that in which it is at preſent moſt generally received, is not mere foſſil alkali, but cryſtals, which are ſome of the pureſt foſſil alkaline ſubſtances in a dry form that are produced by art. Theſe cryſtals contain only one fifth of their weight of real alkali; whereas barilha contains ſomewhat more than one fourth; ſo that in this point of view, ſoda ſeems a leſs proper term even than *barilha* to denote pure foſſil alkali.

Neither can much be urged in favour of the term ſoda from its origin. Some ſuppoſe it deduced from the Arabic; but the Arabic ſoda has ſo different a ſignification, that I cannot ſuppoſe it and ours at all related. It means a pain of the head: and is derived from a word which ſignifies the temple. The moſt probable derivation, in my opinion, is from the German ſode, which is ebullition, and comes from ſieden to boil, that from ſod water, and this laſt perhaps from υδος. The word ſode was rhetorically applied in two ways: firſt in pathology, to ſignify the diſeaſe which we call the heart-burn, and which was ſuppoſed to be owing to the ebullition of yellow bile at the upper orifice of the ſtomach; ſecondly in chemiſtry, to ſignify a cryſtallized alkaline ſalt, procured in its ſtate of cryſtallization by boiling. Whether this be the true origin of the term, or whether it took its riſe (as Mr. Kirwan ſuppoſes) from the French *ſoude*, in conſequence of its having been employed in the ſoldering of metals, is a matter of little moment.

However, if the foſſil alkali muſt be denominated by a ſimple name, ſoda ſeems leſs objectionable than any of its competitors, not only from its general reception among chemiſts, having been long adopted by the college of phyſicians of Edinburgh, and lately by the French nomenclators; but becauſe " the

“ cryſtals of ſoda are the fitteſt ſtandard with “ which other ſubſtances containing the ſame “ ſort of alkali may be compared, the propor- “ tion of alkali in ſoda being always the ſame.” *(Mr. Kirwan.)*

## § 4. *VOLATILE ALKALI.*

The impropriety of uſing the word *ammoniac*, after the French, to ſignify volatile alkali, will appear evidently from its hiſtory.

When the younger daughter of Lot had a child by her father, ſhe called his name Ben Hammi. He was the father of the Ammonites, *(Geneſis,* xix. 38.) who inhabited that part of Lybia which adjoins the Mediterranean. This territory was called Ammonia. “ Ab Αμμωνιοις “ vero, ſive regione ipſorum, Αμμωνια eſt, & “ poſſeſſivum nomen Αμμονιακος; hoc eſt per- “ tinens ad Ammonios, vel apud Ammonios “ proveniens, naſcens in Ammonia.” *(Stephani append. libell. Theſ. Gr.)* Hence the muriated volatile alkali, which abounded in this country, was called Ammoniacal Salt, or Sal Ammoniac.

Thus it appears that the word ammoniac

is truly an adjective, and pertains equally to the gum, or to any other peculiar remarkable product of Ammonia, as to its ſalt. If we ſhould employ the words Arabic *, Japonic, Peruvian, French, as ſubſtantives to denote the gum, the reſin, the bark, the plumbs, which are reſpectively diſtinguiſhed by theſe adjectives, we ſhould juſtly be accuſed of a groſs abuſe of ſpeech. Ammoniac lies exactly in the ſame predicament.

*Ammonia* was next introduced, by the college of phyſicians of London, and received by that of Edinburgh, in the ſame ſenſe as the French ammoniac. But there appears no reaſon why any modification of this word ſhould belong more eſpecially to the alkali than to the acid. If analogy were to guide nomenclature, as the ſalt of Nitria lent its name to denote its acid conſtituent part, ammonia ſhould in like manner denote, not the alkali, but the acid of ſal ammoniac. This very analogy actually ſtruck ſome of the ancient chemiſts; for example muriated lime was called by Holland fixed ſal ammoniac.

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* I had written this paſſage before I diſcovered that the college of phyſicians of Edinburgh, in the laſt edition of their Pharmacopœia, changed the name of gum Arabic to ſimple *arabicum.*

On this head I muſt not omit to add Mr. Kirwan's obſervations. "Volatile alkalis are "compounds, but their denomination, though "compound, has not the advantage of expreſsing their component parts, and labours under the diſadvantage of not being convertible into an adjective, which is often requiſite. Hence I would propoſe to convert "its compound denomination into the ſimple "VOLALKALI, the ſenſe of which cannot be "miſtaken, and which is eaſily converted into "the adjective volalkalized *."

In

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* If at this period of our progreſs in chemiſtry it were thought proper to make any alteration in the nomenclature of our ground-work,

"Si forte neceſſe eſt
"Indiciis monſtrare recentibus abdita rerum,
"Fingere cinctutis non exaudita Cethegis,"—

I have ſometimes thought that the ſimpleſt plan would be the moſt intelligible, and therefore the beſt; which would be merely to condenſe the old names, retaining only their

In the uſe of this adjective, however, Mr. Kirwan has experienced an inconvenience, which has induced him ſometimes to uſe in its ſtead the new term FULIGINATED, in alluſion to the chief ſeat of volatile alkali. For example, the tunſtenic acid uncombined is not ſoluble in water, and cannot be rendered manifeſt as an acid. The addition of an alkali, particularly the volatile, educes and exhibits its acid nature. This combination with vegetable alkali he calls *acid tartarinated tunſtenic calx*, with volatile alkali *acid fuliginated tunſtenic calx*. Perhaps, however, theſe ſubſtances might be denominated in another way more agreeably with analogy, and all occaſion for inventing a new term might be thus ſuperſeded. Theſe ſubſtances are, if I conceive aright, neutral ſalts with exceſs of acid, they may therefore be called ſuper-tunſtenated vegetable, and volatile alkali.

their moſt important members, and exchanging the long word vegetable, for its more compliant ſynonym plant: thus alkalis might be reſolved into PLANKALI, FOSKALI, and VOLKALI.

### § 5. *ALKALINE AIR.*

This is aëriform volatile alkali. No other ſpecies of alkali having been yet made to aſſume the form of air, this name, which was conferred on it by its diſcoverer Dr. Prieſtley, may ſuffice. If there ſhould be occaſion to denominate it more preciſely, it might be termed VOLATILE ALKALINE, or VOLALKALINE AIR.

The French have entitled it *ammoniacal gas*, the impropriety of which name is evident from what has been already ſaid.

## CHAPTER VI.

## NAMES *of* EARTHS.

### § 1. *DENOMINATION OF EARTHS IN GENERAL.*

THE earth, like the air, is often uſed κατ' εξοχην, as a proper name, to ſignify the whole ſolid maſs of our globe. When uſed with a general inſtead of a ſpecifying article prefixed to it, or without any article in the plural number, it becomes a generic term.

The different ſorts of earths have been denominated after a two-fold manner; by a ſpecific appellative combined with the generic one *earth*; and by an appropriate ſortal ſubſtantive. The latter mode of denomination, though not, as I conceive, permiſſible in the caſe of acids, and ſcarcely ſo in that of alkalis, ought, however, to be adopted with regard to earths, as well as metals. In every caſe it is more commodious, on account of the brevity it admits:

in this caſe the ſortal ſubſtantives are equally clear, and nearly as familiar to the chemical ear, as the circuitous appellatives.

### § 2. *LIME.*

This old Saxon word has from time immemorial been uſed in our language, to denote the predominant earth of limeſtone.

" *Limeſtone*, *chalk*, *ſpar*, &c. denote ſome pe-
" culiar families of the calcareous genus; but
" terms denoting this earth abſtractedly con-
" ſidered, and others expreſſive of its ſtate as
" combined with, or freed from fixed air, are
" neceſſary. When abſtractedly conſidered, it
" may be called *calcareous earth*, or *calx*:
" when conſidered in its moſt uſual ſtate, that
" is in the ſtate of combination with fixed air,
" it may be called *aërated calx*, or *mild calx*:
" and when conſidered as freed from fixed air
" and other ſubſtances, it may be called *lime* or
" *common lime*." (*Mr. Kirwan.*)

The French uſe the word *chaux* as we do in Engliſh *calx* to ſignify any ſubſtance reduced by fire to the appearance of lime; thus they have *chaux d'or*, &c. which we call *calx of gold*, while *chaux* by itſelf ſignifies pure calcareous earth. We have an advantage over them in point of perſpicuity and correctneſs, in not uſing ſuch expreſſions as *lime of gold*, &c. But as the word *lime* by itſelf ſignifies calcareous earth freed from all adventitious ſubſtances, ſo there appears no impropriety in tranſlating their *carbonate de chaux*, *aërated lime*, and ſo forth, with regard to other ſalts compoſed of an acid and calcareous earth. This appears the more juſtifiable, as calcareous earth, deprived of water and fixed air, is not ſo commonly termed lime as *quick lime*.

The word *calcareum* was propoſed by Bergman to denote the pure earth, in the ſenſe in which we uſe lime. His propoſed corrections, however, (which reſpected the other earths alſo) have not met with any advocate.

### § 3. *MAGNESIA.*

THIS ſpecies of earth appears to have been firſt introduced to the medical world as *count Palma's powder*, and preſently afterwards to have received the name of magneſia, by which it has been ſince very generally known.

The pure earth, diveſted of adventitious air and water, has ſometimes been diſtinguiſhed from aërated magneſia by the epithets *calcined*, and *burnt*. Theſe however are ſuperfluous, becauſe the uncombined name of uncompounded earth cannot denote a compound. They are incorrect, becauſe the pure earth may be procured without the aid of fire; for inſtance, by precipitation from vitriolated magneſia with a pure alkali. Finally, the latter of theſe denominations, *burnt*, is ſoleciſtical, becauſe all earths are by poſition incombuſtible.

Bergman propoſed that this earth ſhould be called *magneſiacum*. But this name appears to poſſeſs no advantage over magneſia; and it has never been uſed.

Neither has the name *muriatic earth* any title to ſuperſede magneſia. For although it be true that this ſubſtance is, in certain ſpecimens, a marine or muriatic earth, being found in the ſea, yet it has neither an excluſive nor a preeminent claim to that epithet. It is not the only earth, or even that moſt abundantly contained in the ſea; for muriated lime is always diſcoverable in ſea-water, and in ſalt ſprings; and there is more lime than magneſia mixed with ſea ſalt, as appears from M. Bonvoiſin's experiments *. Neither is magneſia found principally in the ſea; it chiefly abounds in wells, as thoſe of Epſom, Egra, Seidlitz, and Seydſchutz. Moreover, if this name ſhould be ſelected for the purpoſe of expreſſing a compound of magneſia and ſome other ſubſtances, by uſing the adjective muriated, this contrivance would be utterly unjuſtifiable; for the adjective muriated belongs by prior, and therefore excluſive, right to muriatic acid.

The name *muriacite*, invented by Dr. Hopſon, is obviouſly liable to the objections juſt urged againſt muriatic earth; and is, beſides, an uncouth, and unclaſſical hybrid.

### § 4. *ARGIL.*

THIS word was uſed of old in the Engliſh language to expreſs the ſame idea as the Latin *argilla*, and the Greek αϱγιλος. By theſe words

* See his table in *Annales de Chimie*, iv. 175.

was underſtood the pure earth, as is evident from its original name, which was derived from αργος, white.

Since the revival of this term by Mr. Kirwan, it has received the ſtamp of currency, ſo as now to appear unobjectionable.

Bergman propoſed the converſion of the adjective *argillaceum* into a ſubſtantive which ſhould denote this earth in its pure ſtate. But this philological innovation appears altogether unneceſſary, and has never been ſanctioned by any uſe.

The names *argillaceous earth*, *aluminous earth*, *pure clay*, conſiſting of two parts, without any neceſſity or advantage of ſuch conſtruction, deſerve to fall into diſuſe.

*Alumine* was invented by the French nomenclators, to denote the ſort of earth here ſpoken of, which is the ſame with that contained in the ſalt now termed alum. But it appears to me that they have been rather unhappy, in abandoning a correct and claſſical expreſſion, and in embracing one of inapplicable and ambiguous import.

The term alum has undergone a material alteration in its ſignification ſince the days of Pliny. The ϛυπτηρια of Herodotus, Dioſcorides, and Galen, and the *alumen* of Columella and Pliny, were uſed in the ſame ſenſe, to expreſs a ſaline ſubſtance uſed in medicine as a ſtyptic, and in the art of tanning as an aſtringent. The etymology of the Greek word, concerning which there can be no controverſy, indicates the leading quality of this ſubſtance. Τȣτȣ τȣ φαρμακȣ ϗ τ᾽ ȣνομα παρωνομαϛει τη ϛυψει, σφοδροτατην· γαρ αυτην εχει. (*Galen de ſimp. med. l.* ix. c. 3.)

The origin of the Latin word is uncertain, and has ſet critics at variance; we ſhall therefore content ourſelves with enquiring into the real nature of the ſubſtance denoted by the words ϛυπτηρια and alumen.

That the alum of the ancients was entirely different from ours, is evident from this, that theirs muſt have been a native production, ſince the fabrication of the earthy ſalt which we denominate alum cannot be traced higher than the twelfth century; but pure cryſtals of native alum, or ſuper-vitriolated argil, have ſcarcely ever been found, only, I believe, in ſome of the mines of Germany, and there in very ſmall quantity.

Dioſcorides, who treats of this ſubject more intelligibly than either Hippocrates, Galen, or Pliny, diſcriminated three ſpecies of alum, Στυπτηρια σχιϛη, ϛρογγυλη, ϗ υγρη; or ſciſſile, round, and effloreſcent *. From the deſcriptions which he gives of theſe ſubſtances, it is difficult to deduce more than this, that they were different in their external appearance, but agreed in having a ſtyptic taſte; by which Dioſcorides diſtinguiſhed them from ſtones ſomewhat ſimilar in their appearance, with which others had confounded them. Hence the learned Beckmann concludes that ϛυπτηρια and alumen were truly generic terms, compriſing every ſpecies of ſalt compoſed of vitriolic acid and either earth or metallic calx, with which the Romans were acquainted. *(Hiſt. Alum. Commentat. Gotting.* i.)

How widely different then were the Roman

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[*] Υγρη is not liquid, as ſome have rendered it; for the context plainly ſhews that Diſcorides ſpoke of a ſolid ſubſtance.

aluminous ſalts, and the French aluminous muriates, nitrates, borates, &c.!

## § 5. *SILICE.*

*Silex* properly ſignifies flint; but it has been often uſed to denote the pure earth which abounds moſt in flint and rock cryſtal. For the ſake of diſtinction between the ſimple and the compound ſubſtance, I think we may denominate the former in Engliſh, ſilice. This word, adopted from Guyton and other French chemiſts previous to the nomenclatural revolution, is ſo very ſparingly detorted from ſilex, that it never can be miſunderſtood.

The word *ſilicite*, transferred into our language from the new French nomenclature, is formed according to analogy with certain Anglified Greek words, and is not conformable to the uſage of our tongue.

The *ſiliceum* of Bergman is open to the ſame objections as his names for the other earths.

*Siliceous*, *quartzoſe*, *vitrifiable earth*, being unneceſſary and diſadvantageous compounds, may be rejected without any apology.

## § 6. *BARYTE.*

The preference given to a name derived from the Greek above one of Latin origin may, perhaps, be cenſured as a deviation from the general principles laid down with regard to the etymology of new names. But in the application of all general principles it muſt be remembered that particular circumſtances may occaſionally warrant a deviation from them. Such circumſtances occur here. The convenience of diſpatch requires a preference of one word to two: the other earths admit eaſily of ſuch denominations: the earth in queſtion is known, perhaps, as generally by one denomination as by the other: and finally, the uſe of this Greek-deſcended term has been ſanctioned by the authority of the moſt diſtinguiſhed chemiſts; of whom, beſide its author Mr. Kirwan, I need only name ſir Torbern Bergman, and M. Guyton. Baryte however appears more congenial to the Engliſh as well as to the French language than *barytes*.

This earth having been firſt detected in ponderous ſpar, and poſſeſſing much greater ſpecific gravity than any other known ſpecies of earth, was aptly termed, by its diſcoverer Scheele, *terra ponderoſa.* This name will probably preſerve its ground for ſome time, as a ſynonym to baryte.

Bergman, according to the licence he ſo often aſſumes, of converting adjectives into ſubſtances, frequently calls this earth ſimply *ponderoſa*, a name which, if it had obtained reception among chemiſts, I certainly ſhould prefer to one of Greek extraction.

According to Mr. Kirwan, "*Baryte* or *ponderous earth* may ſtill retain thoſe names when abſtractedly conſidered, with the addition of *mild*, or *cauſtic*, or *barytic lime*, when its ſtates are denoted."

### § 7. STRONTHIA.

This is a newly-diſcovered earth (ſomewhat akin in its properties to lime and baryte) which has been found near Stronthian in Scotland; whence its name.

## § 8. *JARGONE.*

By this name is denoted the peculiar ſpecies of earth which has been diſcovered by M. Klaproth, and ſound only in the ſtone called jargon of the iſland of Ceylon. Hence it has been generally called *jargonic earth.*

I think we have no reaſon to believe that this ſtone is the ſame with that gem which the ancients, from its emulating in colour and vividneſs the eye of a hawk, called *circos.* I would therefore avoid denominating it after the German zirkon, *circonian earth.*

## § 9. *SIDNEIA.*

This name has been employed to denote the peculiar ſpecies of earth detected by Mr. Wedgwood in a mineral brought from Sidney-Cove in New South Wales.

Dr. Pearſon, alluding to its origin, calls it *auſtrala*; but as its diſcoverer denoted it by a more particular local reference, there ſeems to be a propriety in adhering to its original denomination.

§ 10.

## § 10. *ADAMANTIA.*

THE earth diſcovered by M. Klaproth in adamantine ſpar may be thus entitled.

Dr. Pearſon calls it *adamantine*, a word which good Engliſh writers have been long accuſtomed to employ as an adjective indicative of adamant itſelf.

## § 11. *OSSIA.*

M. RICHTER (*Ueber die neuern Gegenſtände der Chymie*, *Breſslau*, 1791.) announces the diſcovery of a new earth, which, he ſays, he has found combined with phoſphorated lime in bones. This earth, he ſays, does not efferveſce with acids, although it be precipitated by aërated alkali: ſaturated or ſuperſaturated with vitriolic acid it does not become alum: and in the dry way it unites with almoſt all the acids. Theſe teſts, however, are not concluſive in favour of his opinion. The ſubſtance he examined may be ſelenite. He calls it *animal earth*, until, as he ſays, a name better accommodated to it be propoſed. If it ſhould be proved to be a peculiar earth, I would call it *oſſia*, a ſimple name, like thoſe of the other earths, and one referring exactly to the ſeat wherein only it appears to have been detected.

# CHAPTER VII.

## NAMES of METALS.

### § 1. DENOMINATION OF METALS IN GENERAL.

THE nomenclature of metals has not ſuffered ſo much from the contentions of chemiſts, as that of other claſſes of natural bodies. Alchemiſts, indeed, have made ſtrong attempts to involve the chemiſtry of the metals in confuſion; and, among other arts, diſcarded their popular names, and diſtinguiſhed them by thoſe of the planets. Some remains of their myſtic ingenuity ſtill ſubſiſt; but, like the ruins of a diſmantled fortreſs, they ſerve only to ſhew what hoſtilities were once meditated againſt philoſophy. Mars and Saturn occaſionally viſit us, and Mercury is naturalized in England; but theſe great names have no longer any undue authority.

As there is ſcarce any diſpute about the nomenclature of the metals, it ſeems unneceſſary to enumerate them; I ſhall therefore diſmiſs this part of my ſubject, after a word or two upon metallic monarchy.

Gold was not unaptly ſtyled the king of metals, and, certainly, no revolution in human affairs is leſs probable, than the depoſition of this monarch. I ſhall not preſume to treat his majeſty with irreverence, but I believe I need not be ſo ceremonious with his tributary *reguli.*

The alchemiſts, ſtudious to conceal the knowledge, which they ſuppoſed would lead the way to inexhauſtible treaſures, were addicted to the moſt fanciful figurative expreſſions. Hence the title of *regulus,* conferred on the ſemimetals in general, and on antimony in particular, to diſtinguiſh it from the compound of metal and ſulfur, which they called antimony, and which appeared to require a name ſimilar to thoſe of the pure metals, becauſe the ore of antimony was in general treated to yield this compound, as other ores were to yield metals. But in the application of this title the alchemiſts were not merely whimſical, they were confuſed and inartificial in the extreme. Antimony, procured from the ſulfurated calx of antimony, by means of the black flux and a little ſoap or oil, was called regulus of antimony; but the ſame metal, procured by means of tin, ſilver, copper, or iron, (which, when fuſed with ſulfurated antimony, attract the ſulfur) was diſtinguiſhed by the name of the metal employed in the proceſs, regulus of Jupiter, of Diana, of Venus, of Mars. Nothing could be more unſcientific than this mode of denomination; for although the antimony obtained by any of theſe latter proceſſes be alloyed by a minute admixture of the metal employed to ſeparate the ſulfur, yet regulus not being a title ſolely appropriated to antimony, the mention of the alloy in place of the principal metal muſt neceſſarily tend to miſlead.

Diſcarding, therefore, the title of regulus, I would always underſtand by the ſeveral terms, antimony, cobalt, arſenic, &c. the reſpective pure ſemimetals. Let us conſider, for example, the moſt noted of theſe, antimony (or ſtibium, as it ſhould certainly be called in Latin, not antimonium.) The native mineral may be called crude antimony, the metal extracted from it, ſimply antimony. It is true, the ſame name has been often applied to the ſulfureous ore of antimony cleared of its gangue. But it has been more generally uſed, and even by the ſame perſons who employ it in that ſignification, to denote the pure ſemimetal. Thus we hear from Swab, Cronſtedt, and Mongez, of mines of native antimony; from Sage and Bergman, of the arſenical ore of antimony; and in the ſhops of the apothecaries, of butter of antimony, tartariſed antimony, &c.; in all of which inſtances the word antimony is to be underſtood as utterly excluding from its ſignification the idea of ſulfur.

## CHAPTER VIII.

## Names *of* Neutral Salts.

### § 1. *DENOMINATION OF NEUTRAL SALTS IN GENERAL.*

THE ſeveral combinations of acids with alkalis, earths, and metals, have been ſcientifically denominated after a twofold manner. The firſt and moſt general method is, by converting the name of each acid into an adjective, and aſſociating it with the ſubſtantive name of the particular alkali, earth, or metal, the combination of which with that acid is to be denoted; as, *muriated foſſil alkali*, or *ſoda*, *phoſphorated lime*, *nitrated mercury*. The other method is, by converting the name of each acid into a general term, ſignifying a middle ſalt of the denomination indicated by that term, and either ſubjoining to it the ſubſtantive name, or prefixing to it an adjective formed from the name of the particular alkali, earth, or metal, the combination of which with that acid is to be denoted; as, *muriate of ſoda*, *phoſphate of lime*, *nitrate of mercury*, or *ſodan muriate*, *calcareous phoſphate*, *mercurial nitrate*.

Adjectives and dependent caſes of ſubſtantives are introduced into language for the ſame end, namely, to modify kinds into ſorts. By the former method, therefore, the ſeveral alkalis, earths, and metals, form the generic foundations, and the ſpecies are determined by the acids. According to the latter mode, the acids conſtitute the generic differences, and the alkalis, earths, and metals, the ſpecific ones. The firſt perſon of note, who drew out a ſyſtem of names of neutral ſalts upon the plan of denominating the acids as genera, and the alkalis, earths, and metals, as ſpecies, was Bergman. This ſyſtem appears to have been ſketched in a moment of ſportive whim, wherein neither his judgment was conſulted, nor even his ingenuity arouſed. When he had, in a preceding part of his work (*Opuſc.* iv. 208.) conſidered the queſtion, whether neutral ſalts ſhould be referred to the genus of acids or of alkalis, he at firſt heſitated, conſidering it as a matter of indifference, but at length decided in favour of the latter: "Indifferens eſſe videtur, utrum ad "acidum an ad alkali referentur; poſterius ta"men, me quidem judice, commodius eſt." Accordingly, in his meditations on the natural ſyſtem of foſſils, he arranges alkalis, earths, metals, and phlogiſtic ſubſtances as genera, and explores the ſpecies of theſe according to their combinations with different acids, or of ſome of them with alkalis; but on a ſudden he deſerts his original plan, and exhibits a curious liſt of new names of alkaline and metallic neutral ſalts, not one of which any chemiſt, nay not even himſelf, ever attempted to bring into actual ſervice. Indeed, few people know that ſuch names as the following were propoſed at all, much more by ſo great a man as Bergman: *vitriolicum potaſſinatum*, *nitroſum natratum*, *muriaticum ammonicatum*. But a ſingular circumſtance remains to be told, which is, that he found the earthy neutral ſalts too refractory to bend to his new ſyſtem. Theſe "terræ ſalinæ "a terreſtri potentiore, & ſalinum quaſi ſuf"focante,"

" focante," were therefore obliged to be denominated in the old way, *barytes vitriolatus*, *calcareum fluoratum*, *calcareum aëratum*, &c.

Of theſe two modes of claſſification, it appears to me that the original one, which conſigns the generic rank to alkalis, earths, and metals, and reſerves the acids for the diſtinction of ſpecies, deſerves the preference. The following reaſons decide me in this opinion.

Firſt, the more important powers ſhould determine the genus; thoſe of inferior rank, the ſpecies. Now, though it be acknowledged that in ſome middle ſalts it is impoſſible to determine to which of the conſtituent parts the characteriſtic powers are principally attached, yet it may be affirmed, that in none are they principally connected with the acid; in many, with the alkali, earth, or metal. Thus, fixed air, in any of its combinations, can ſcarcely be ſaid to controul the characteriſtic quality of the ſubſtance with which it is joined: thus the compounds of mercury and any acid cure the venereal diſeaſe; the compounds of iron and any acid corroborate the muſcular ſyſtem; the compounds of antimony and any acid prove emetic; the compounds of copper and any acid are poiſonous. Is it not undeniable, that thoſe qualities of ſubſtances, by virtue of which the human body is affected, are the moſt intereſting, and therefore the moſt important to mankind?

The ſubſtances then, in which theſe qualities are inherent, or to which they are principally attached, ſhould form the generic roots; and thoſe by which theſe qualities are modified, the ſpecific branches.

Of the ſcientific propriety of this kind of arrangement M. Fourcroy was ſo well aware, that although he denominates ſyſtematically the ſeveral neutral ſalts conformably to the claſſification of the chemical confederates (of whom himſelf was one) yet in his lectures he acknowledges that he found it adviſeable to inſtitute another plan for ſcientific purpoſes. "The "baſe," he ſays, "appears to communicate "ſome general or common properties to neu-"tral ſalts, for which reaſon I have claſſed theſe "ſalts into genera by their baſes."

Secondly, a ſtill more cogent reaſon for this kind of arrangement may be drawn from the chemical nature of the ſubſtances under conſideration. Every individual alkali, earth, and metal, is a diſtinct and peculiar ſubſtance, incapable of being converted into any other alkali, earth, or metal. But this is not the caſe with acids, ſeveral of which appear to be compoſed of the ſame conſtituent parts united in different proportions, inſomuch that ſome of them are actually convertible into others. Thus, by applying different quantities of nitrous acid to ſpirit of wine, Weſtrumb obtained ſometimes tartareous, ſometimes ſaccharine, and ſometimes acetous acid. In fact all the vegetable acids may be converted into the acetic. Now if alkalis, earths, and metals lay the foundation of the generic diſtinctions of neutral ſalts, the converſion of any acid into another, by the addition or ſubtraction of oxygen, will produce no diſturbance beyond the ſingle inſtance wherein the change of the acid occurs; but if acids lay the foundation of the generic diſtinctions of neutral ſalts, the converſion of any one acid into another will cauſe as many changes in the table of arrangement, and conſequently in the names of neutral ſalts, as there are alkalis, earths, and metals. In the former caſe only one ſpecies of a genus is changed; in the latter caſe, a genus is changed, and conſequently all the ſpecies comprehended under it.

The advocates for the new ſyſtem of nomenclature allege an advantage in their method of denominating middle ſalts, which they ſeem to thing of conſiderable importance. Of each acid they conſtitute three genera, correſponding to three degrees, which they have imaged to themſelves, of its impregnation with oxygen. The neutral ſalts, formed by an acid in the loweſt or ſubſaturated ſtate of impregnation, they denote by the termination *ite*; in the middle or ſaturated ſtate, by the termination *ate*; and in the higheſt or ſuperſaturated ſtate, by the ſame termination, with the adjective *oxygenated* prefixed to the name of the genus. Thus *ſulfites* are neutral ſalts compoſed of the ſulfureous acid and any alkali, earth, or metal; *ſulfates* are neutral ſalts compoſed in like manner with the ſulfuric or vitriolic acid; and *oxygenated ſulfates* are neutral ſalts compoſed with the oxygenated ſulfuric, or oxyvitriolic acid.

Concerning the ingenuity of this management, which has been extolled with many praiſes, I ſhall not contend; but in my opinion it is neither ſcientific nor expedient. It is not ſcientific, becauſe, in the firſt place, differences in kind ſhould have a preference in philoſophical arrangements to differences in degree, which latter are often no more than varieties; and among acids, thoſe of the vegetable tribe alone change their characteriſtic or generic properties according to the proportions of oxygen with which they are combined. Secondly, becauſe this diſtinction of neutral ſalts, by three degrees of oxygenation of their acids, is arbitrary, and fallacious. The ſame acid with which we compoſe neutral ſalts of different ſpecies is always in a different ſtate of oxygenation in alkaline, earthy, and metallic ſalts; nay, perhaps, every ſubſtance capable of combination with an acid exhibits its affinity to it, eminently, or even in ſome inſtances ſolely, when the acid is in a ſtate of oxygenation peculiarly adapted to it. Metals in general require the acids with which they unite to be more oxygenated than alkalis or earths do; and ſome metals require a greater degree of oxygenation than others; yet manganeſe will not unite with the nitric acid until it loſe ſome of its oxygen and become nitrous acid; while vegetable alkali affects the nitric, and regards the nitrous ſo little, that it reſigns it even to the acetous. If modes of accurately diſtinguiſhing more than three degrees of the impregnation of acids with oxygen ſhould be diſcovered, who does not ſee that this diſcovery would introduce an innumerable multitude of ſubordinate genera and ſpecies, moſt of which diſtinctions would be merely ſyſtematic and imaginary, and therefore in practice utterly uſeleſs, if not deceptive.

Even at preſent this contrivance of the French reformers is inexpedient, and unſuited to the ſtate of our knowledge. Of neutral ſalts of three different kinds, formed by the ſame ſubſtance with the ſame acid in three different ſtates of oxygenation, there is but one example; of even two kinds of ſuch ſalts there are but a few inſtances, in only three or four of the acids; yet for the ſake of claſſing theſe ſyſtematically, ſeventy-eight diſtinctions of neutral ſalts have been introduced, and ſpecifically arranged under each of the acid heads.

In fact, we find that there is ſeldom occaſion for ſpecifying the degree of oxygenation of the acid in the compound name of a neutral ſalt, except in the caſe of ſalts, the acid of which is ſuperſaturated with oxygen. Theſe can eaſily be denominated after Mr. Kirwan's manner (more eaſily indeed than after that of the French) for example, OXYVITRIOLATED SODA, OXYMURIATED TARTARIN.

The latter of theſe names calls to mind a ſingular diſquiſition in the department of chemical philology by M. Sage. (*Obſ. ſur la Phyſ.* xxxviii. 313.) Diſſatisfied with the French name, *oxygenated muriate of potaſh*, and profeſſing to exhibit a correct model of chemical nomenclature, he calls the ſubſtance of which we are ſpeaking, *fulminating manganeſed tartar*, and enters into an elaborate defence of this creature of his ingenuity.

But to denominate this ſubſtance by a new and competent name, it is neceſſary to expreſs ſomething more than "the combination of the "alkali of tartar with the acid principle of "manganeſe," which he ſeems to think he has done, and by ſo doing given a name "omni-"bus numeris abſolutum." Tartar cannot mean the mere alkali of itſelf. Manganeſed cannot mean oxymuriated; and ſince it cannot, what it is intended to mean is little to the purpoſe. Oxygen is much leſs "the acid "principle of manganeſe," than of ſome other metals, and ſtill leſs ſo than of a conſiderable number of other ſubſtances; but it is perfectly ridiculous to entitle a double neutral ſalt by a name conſiſting of three words, none of which indicates the preſence of one of its moſt material conſtituent parts, and yet to aſſert, "cet expreſ-"ſion n'eſt pas defectueuſe."

As the metallic neutral ſalts, compoſed with acids highly impregnated with oxygen, are always cauſtic, I would in general prefer entitling them nearly by their old denominations, as *cauſtic muriated antimony*, *corroſive muriated mercury*, inſtead of oxymuriated antimony and mercury. This compliance with popular language cannot be regarded as a deviation from philoſophic preciſion; and it may ſerve as a guard againſt dangerous miſtakes in pharmaceutical practice.

To the conſiderations already advanced on the queſtion of the arrangement and conſequent nomenclature of neutral ſalts may be added the following obſervation of Mr. Kirwan's: "That "the advantages of the French mode of nota-"tion do not compenſate for the violence it "offers to the integrity of our language; and "that they may with leſs harſhneſs be otherwiſe "attained."

I have no heſitation, therefore, in ſhaking off this cumbrous and ſuperfluous load of ſyſtem, and in recurring to the ancient ſimple and unembarraſſed mode, which we ſhall find equally replete with the means of diſcrimination.

In the denomination of neutral ſalts, by the compoſition of the names of their conſtituent parts, two circumſtances require attention; one, concerning which we have already ſpoken, the degree of oxygenation of the acid; the other, the proportion of the acid to the other ingredient with relation to the point of ſaturation. The varieties ariſing from the variations of this proportion are eaſily and ſimply diſtinguiſhed in the following manner. When the acid and the other conſtituent part of the neutral ſalt are united to the exact point of ſaturation, the ſalt is denominated by combining an adjective formed directly from the name of the acid with the name of the alkali, earth, or metal, which forms the baſe, as vitriolated vegetable alkali, or vitriolated tartarin; when the acid predominates, this is expreſſed by prefixing to the adjective the prepoſition *ſuper*; when the acid is deficient, by employing in like manner *ſub*. Thus we have SUPERVITRIOLATED, SUPERARSENICATED, and SUPERSACCHARATED VEGETABLE ALKALI (not to mention alum, or the CRYSTALS and CREAM OF TARTAR, which are better denominated by their old appellations, than by thoſe of *ſupervitriolated argil*, or *ſupertartariſed vegetable alkali)*; we have alſo SUPERVITRIOLATED, and SUPERTARTARISED FOSSIL ALKALI; and, on the other hand, we have SUBARSENICATED FOSSILE ALKALI (beſide BORAX, which it would be pedantic to call *ſubborated foſſil alkali)*; we have alſo SUBVITRIOLATED and SUBNITRATED MERCURY, SUBMURIATED COPPER, and ſome others of the ſame ſort.

## § 2. *DENOMINATION OF TRIPLE NEUTRAL SALTS.*

I HAVE hitherto ſpoken of the denomination of double ſalts only. Triple and quadruple ſalts are not ſo numerous as to require the ſame contrivance in their denomination to aid us in recollecting their compoſition; and names conſtructed on the ſame plan as thoſe of double ſalts would be ridiculouſly long and inconvenient.

In a few inſtances only can triple ſalts be denominated according to their compoſition; I mean where two of their component parts are known by a name conſiſting of but one word: for example; TARTAR is the name of a compound conſiſting of the tartareous acid and vegetable alkali; this ſubſtance, united with foſſil alkali or ſoda, forms a triple ſalt, commonly called *Rochelle ſalt*, which might be denominated ſo as to expreſs its compoſition by the name SODATED TARTAR.

The colleges of phyſicians of both London and Edinburgh have given names to this ſalt, which have an evident tendency to miſlead thoſe, who truſt to nomenclature for a developement of the nature of the ſubſtances ſyſtematically named; they call it *natron tartariſatum*, and *ſoda tartariſata*. The adjective tartariſatus merely implies, and ought to imply, no more than the combination of the tartareous acid. This ſignification is warranted by analogy and by uſe. Of the vanity and impropriety of attempting to attach any other ſignification to that word, I cannot give a more ſtriking inſtance, than the following quotation from Dr. Prieſtley's Lectures on Experimental Philoſophy; a book deſigned for the inſtruction of ſtudents in the principles of chemiſtry. Speaking of the tartareous acid he ſays (p. 56.) "this acid, united "to the mineral alkali, makes Rochelle ſalt." If ſuch a man as Dr. Prieſtley be miſled by the abuſe of chemical language, is it reaſonable to expect that the tyro in medicine, or the illiterate apothecary, will not fall into a ſimilar miſtake?

The ſame impropriety appears in the new name of tartar emetic, in which both the forementioned colleges coincide, *antimonium tartariſatum*. The old name, by which this important medicine has been, perhaps, the moſt generally known, STIBIATED TARTAR, expreſſes the combination of antimony with the vegetable alkali and the tartareous acid.

Tartar may be alſo combined with the boracic acid, and this compound may be termed BORATED TARTAR.

Triple ſalts, compoſed of ſal ammoniac (which is the trivial name of muriated volatile alkali) and of a metallic calx, or an earth, may be denominated in a manner expreſſive of their nature; MERCURIAL SAL AMMONIAC, CUPREOUS SAL AMMONIAC, FERRATED SAL AMMONIAC, MAGNESIAN SAL AMMONIAC.

### § 3. *DENOMINATION OF QUADRUPLE NEUTRAL SALTS.*

OF quadruple ſalts I know but one, which can be briefly and properly denominated ſo as to expreſs its compoſition; this is the ſalt conſiſting of the boracic and the tartareous acids combined with the foſſil and the vegetable alkalis, which may be entitled BORACIC TARTAR. By the adjective boracic we may be underſtood to predicate of borax, as by borated we do of the boracic acid only.

## § 4. *TRIVIAL NAMES OF PARTICULAR NEUTRAL SALTS.*

We have now traced nearly the utmoſt limits to which the ſyſtematic nomenclature of neutral ſalts can be admitted to extend; but we are not to forget that a great many compounds, even within theſe limits, "have already "received denominations, by which they are "fully and unambiguouſly diſtinguiſhed; and "that there is no good reaſon why theſe "ſhould be diſuſed, no propriety in ſuperſeding them by new ones. Of this kind are "the denominations, nitre, common ſalt, ſal "ammoniac, tartar, borax, and thoſe of many "of the ſalts, which have the vitriolic acid for "one of their component principles, as ſelenite, "Epſom-ſalt, alum, vitriols of iron, copper, "ſilver, zinc, &c. Theſe, however, ſhould "be employed in the ſtrict ſenſe to which "they were actually confined; hence we ſhould "now reject the denominations of *nitrous, muriated*, &c. *ſelenites*, *epſoms*, *alums*, as from

"their

" their partial reception they may lead to miſ-
" takes." [Mr. Kirwan.]

### § 5. *NAMES OF CERTAIN METALLIC NEUTRAL SALTS.*

THE general principles of chemical nomenclature being adjuſted, and the names of all the more ſimple ſubſtances being aſcertained, little comparative difficulty remains in affixing their proper titles to the ſeveral compounds.

The tedioufneſs of examining the whole catalogue of theſe ſubſtances would not, however, be compenſated by its utility; I ſhall, therefore, conclude this diſquiſition with a curſory view of ſome ſaline metallic preparations, to the denomination of which the application of general principles is leſs obvious than to that of the alkaline or earthy neutral ſalts.

#### NITRATED SILVER.

THIS ſalt may be prepared either in cryſtals, by the gradual evaporation of its water of ſolution, or in cylindrical forms, with leſs water of cryſtallization, and more ſuitable to medical purpoſes, by being caſt into moulds. In the former ſtate it has been called *lunar cryſtals*; in the latter, *infernal ſtone*; and in both ſtates, *lunar cauſtic*, and *lunar nitre*.

### MURIATED SILVER.

THIS ſalt, when expoſed to heat, aſſumes a grey ſemi-tranſparent appearance, ſomewhat reſembling horn; which has procured it the whimſical name of *horny moon*.

### BLACK CALX OF MERCURY.

THIS is the calx, which, when formed by a rapid and continued motion, ſuch as Boerhaave effected by tying a phial of mercury to the ſail of a windmill, or, as Dr. Saunders did, by ſending it a long journey in a ſtage-coach, received the droll appellation of *the Æthiop by himſelf*.

### RED CALX OF MERCURY.

THIS preparation was ſtyled *precipitate by itſelf*, for the alchemiſts imagined that mercury was fixed or precipitated in the operation whereby it was obtained.

### SUBVITRIOLATED MERCURY.

THIS ſalt has been much known in medical practice by the name of *turbith mineral.* The College of Phyſicians of London entitles it *hydrargyrus vitriolatus*; and that of Edinburgh, *hydrargyrus vitriolatus flavus*, as if it were mercury ſaturated with vitriolic acid; while, on the other hand, the French call it, in their new nomenclature, *yellow oxyd of mercury by the ſulfuric acid*, and ſome of them affirm it to be a mere calx of mercury, which, after the third waſhing, does not contain a particle of acid. The more accurate inveſtigations of M. Fourcroy, however, (*An. de Chim.* x. 294.) ſatisfactorily eſtabliſh the opinion concerning its nature announced by Bergman (*Opuſc.* iv. 227.) that it is one of thoſe ſalts "quæ acido deficiunt, vel quod "eodem redit, baſi metallica excedunt."

## SUBNITRATED MERCURY.

In this preparation a conſiderable part of the acid of nitrated mercury is diſſipated by fire. It has been known in medicine by the obviouſly improper name of *red precipitate*. The London and Edinburgh Colleges of Phyſicians call it *hydrargyrus nitratus ruber*; but this name imports a thing impoſſible; for the cryſtals of nitrated mercury, that is of mercury ſaturated with the nitric acid, are always tranſparent.

Dr. Pearſon, in his Critique upon the Name of the Colleges of Phyſicians (*Tranſl. of Chem. Nomenc.* 14.) falls into the ſame error: "In this "preparation," he ſays, "I can diſcover no "nitrous acid, as its name implies, but merely "oxygen and mercury." Bergman, however, affirms of this, as well as of the preceding preparation, (*Opuſc.* iv. 227.) "optime loti nihilo "minus deſtillando pauxillum acidi produnt."

## MURIATED MERCURY.

This ſalt may be procured by two modes; by triturating corroſive muriated mercury with an additional quantity of the metal, and ſubliming the mixture; and by precipitation from a ſolution of mercury in the nitric acid, by adding the muriatic acid either alone, or combined with ſome alkali or earth. The former preparation has been known by the ſeveral names of *calomel*, *white eagle*, and *ſweet mercury*; the latter, by thoſe of *ſweet mercury precipitate*, and *ſweet mercurial muriate*. If any diſtinction between thoſe preparations were neceſſary, it might be eaſily effected by adding the word ſublimed, or precipitated; but ſuch a diſtinction I apprehend to be needleſs, the nature and influence on the human conſtitution of both appearing to be preciſely the ſame.

### OXYMURIATED MERCURY, or, CORROSIVE MURIATED MERCURY.

Though the former of theſe names is the more ſcientific, yet perhaps the latter is preferable as a trivial name in a pharmacopœia, for the ſake of putting ignorant or giddy people upon their guard with reſpect to its nature. In general, where any chemical preparation employed in medicine is extremely corroſive or cauſtic, and at the ſame time has an affinity in name and compoſition to another ſubſtance of a mild nature, I think it an uſeful precaution to let an intimation of its dangerous quality enter into its name.

This ſalt has been generally called *corroſive ſublimate*; a name, however, very improper, becauſe the identical ſalt may be procured by various proceſſes, without ſublimation; for example, by diſſolving mercury in the oxymuriatic acid; by diſſolving ſubnitrated mercury in muriatic acid, adding water to the ſolution, and then by evaporation procuring the cryſtals; or by pouring oxymuriatic acid, or even ſea ſalt, into a ſolution of nitrated mercury, and then by evaporation obtaining the cryſtals of oxymuriated mercury.

### MERCURIAL SAL-AMMONIAC.

THIS preparation has been termed *white precipitate*, and by the College of Phyſicians of London *white calx of mercury*. The former name is vague, the latter conveys a falſe repreſentation

tion of its nature. The precipitate formed by the addition of volatile alkali to oxymuriated mercury is a triple ſalt compoſed of mercury and ſal ammoniac. It is true, as M. Van Mons has diſcovered, that part of the volatile alkali is reſolved into its conſtituent parts, and from the union of the mephite with ſome of the oxygen contained in the oxymuriatic acid, nitrous acid is generated and diffuſed through the liquor; but M. Berthollet has proved, that part of the volatile alkali deſcends unaltered, and compoſes part of the precipitate. The vegetable alkali, which is ſometimes employed in this proceſs, acts only a ſubordinate part. The ſal ammoniac firſt renders the oxymuriated mercury more ſoluble in the water, and then the vegetable alkali, acting upon the ſal ammoniac, leaves the volatile alkali at liberty to effect the precipitation.

## WHITE CALX OF LEAD.

THIS, whether procured from a ſolution of lead in an acid by precipitation, or from the liquefied metal, by admitting the acceſs of air, has been moſtly termed *ceruſſe*, or *white-lead*.

### YELLOW CALX OF LEAD.

THIS preparation, which is made by expoſing the former again to fire, has been termed *maſſicot*.

### RED CALX OF LEAD.

THIS is procured by ſtill longer expoſure of the ſame ſubſtance to a moderate fire; it has been called *minium*, and *red lead*.

### YELLOW VITRIFIED LEAD.

THIS has been called *golden litharge*, that is to ſay, *golden ſtone of ſilver*. The name litharge has been ſo generally uſed amongſt traders, that, notwithſtanding its impropriety and uſeleſſneſs to the purpoſes of philoſophy, it muſt in all probability ſtill remain as a ſynonym for vitrified lead.

### WHITE VITRIFIED LEAD.

This is the *ſilver litharge* of commerce.

### BLACK CALX OF IRON.

This, when prepared after the moſt uſual manner, by keeping a bar of iron red hot for a conſiderable time, ſo that its ſurface becomes covered with an imperfect calx, which is beaten off with a hammer, has been called *iron ſcales*. When prepared by agitating filings of iron with water till a black powder is diffuſed through the water, which is ſaved and dried in an alembic, it has been ſtyled, after its inventor, *Lemery's martial Æthiopian*.

### RED CALX OF IRON.

This ſubſtance, procured by detonating iron with nitre, has been termed, after its inventor, *Zwelfer's ſaffron of Mars*; procured by precipitation from a ſolution of iron with vegetable alkali by nitrous acid, after its inventor, *Stahl's* *aperient ſaffron of Mars.* Both theſe names have been alſo given to another preparation of iron, of the ſame nature as ruſt.

### SUBVITRIOLATED IRON.

BY torrefaction the cryſtals of vitriolated iron are deprived of part of their acid, as well as of their water of cryſtallization. This preparation has been termed *colcothar of vitriol.*

### FERRATED SAL AMMONIAC.

THIS preparation was termed of old *the ſword of Mars,* and afterwards *martial flowers of ſal ammoniac.* The latter name expreſſes the nature of this triple ſalt correctly, though it is more circuitous and figurative than the appellation I have given it. The London college of phyſicians term it *ammoniacal iron,* but the adjective ammoniacal has been applied, eſpecially by the French, to denote merely the combination of volatile alkali.

### FERRATED TARTAR.

I THINK this name preferable to *tartariſed iron*, which the London college uſe; becauſe, as I have already obſerved, tartariſed is the adjective which is always employed to denote combination with the tartareous acid: this preparation, however, is a triple ſalt, compoſed either of pure tartar, that is tartariſed vegetable alkali, or of cryſtals of tartar, that is ſupertartariſed vegetable alkali, and iron.

### PHOSPHORATED IRON.

THIS was termed *ſiderite* by Bergman: but notwithſtanding the great veneration I have for the character of this eminent philoſopher, I am not for retaining this name, even as a ſynonym; becauſe it was applied by Bergman, under the idea that this was a newly diſcovered and peculiar kind of metal, reſembling iron in many of its qualities, but differing from it eſſentially as a metal. Later obſervations having proved this opinion to be erroneous, the preſervation of the name would anſwer no other end but that of perpetuating the error of a man, whoſe merits were ſo great, that they alone ought to be remembered.

### SUBLIMED CALX OF ANTIMONY.

THIS is the *ſnow*, or *flowers of antimony*.

### DEFLAGRATED CALX OF ANTIMONY.

THIS is what the French call *oxide of antimony by nitre*; what the Edinburgh college of phyſicians formerly called *nitrated calx of antimony*, and now call *antimony burnt with nitre*; and what has frequently been diſtinguiſhed amongſt phyſicians by the name of *diaphoretic antimony*.

### SUB-MURIATED ANTIMONY.

BY this name I intend to denote the precipitate which is obtained by mild alkali, or merely by water, from the liquid cauſtic muriated antimony prepared by diſtillation, or from a ſolution of cauſtic muriated antimony mixed with other ſalts, prepared by boiling a calx of antimony not very pure (procured by the deflagration of nitre and ſulfurated antimony) with vitriolic acid and ſea ſalt, in a ſufficient quantity of water.

I aſſent to the declaration of Bergman, that this precipitate, however made, always contains a ſmall portion of muriatic acid combined with the antimonial calx.

This preparation has been generally called by the name of *powder of Algaroth*, from count Vittorio Algarotti, who was ſtrenuous in commendation of its medical powers.

It has been alſo called by the groſsly improper name of *mercury of life*, becauſe it was procured from cauſtic muriated antimony, the preparation of which was effected by the aid of corroſive muriated mercury.

## MURIATED ANTIMONY.

THIS name ſhould deſign the ſalt compoſed of muriatic acid and antimony. The colleges of both London and Edinburgh give this name to a preparation of a very different nature.

M. Monnet obſerves, that there is a conſiderable difference between the muriated antimony prepared with the calx, and that made with the ſemimetal. If it ſhould be neceſſary to attend to this circumſtance, the name may be rendered generic, and ſpecificating epithets added to it.

### OXYMURIATED ANTIMONY, *or* CAUSTIC MURIATED ANTIMONY.

THESE names properly indicate the ſubſtance which uſed to be called *butter of antimony*, and which has been lately ſtyled *muriated antimony*.

That it is not muriated antimony, is evident from the difference not only of the properties of theſe two ſalts, but of their appearance when cryſtallized. The one cryſtallizes in ſmall needles, the other in hexahedral priſms with dihedral ſummits.

That it is oxymuriated antimony, appears from a mode of preparing it pointed out by Mr. Ruſſel of Edinburgh, namely by expoſing antimony to oxymuriatic air, procured by diſtilling muriatic acid from the black calx of manganeſe. (*Tranſ. R. Soc. Ed.* i. 16.)

## STIBIATED TARTAR.

By the aid of M. Vauquelin's analyſis of this ſubſtance (*Fourc. Med. eclairée*, iii. 355.) we are enabled to juſtify the propriety of its old name. One hundred parts of it conſiſt of 33 of calx of antimony, 47 of tartareous acid, 13 of vegetable alkali, and ſeven of water. It is therefore ſtrictly what this name imports.

It has alſo been known under the deſignations *emetic tartar*, and *tartariſed antimony*. Of theſe the former is merely a medical title; the latter is a chemical miſnomer, implying ſimply the union of the tartareous acid with antimony; whereas upwards of one eighth of this ſubſtance conſiſts of vegetable alkali.

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### *Principal Errata.*

| | | | | | |
|---|---|---|---|---|---|
| Page | 5 | line penult. | *for* or | ------- | *read* of. |
| | 52 --- | 1 | — hydrargyrum, | — | hidrargyrum. |
| | 176 --- | laſt | — Myrrhimenta, | — | Myrrhinunta. |
| | 249 --- | 14 | — muriacite | — | muriœcite. |

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